AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 4, No. 16. WEEKLY. | NEW YORK, APRIL 16, 1881. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

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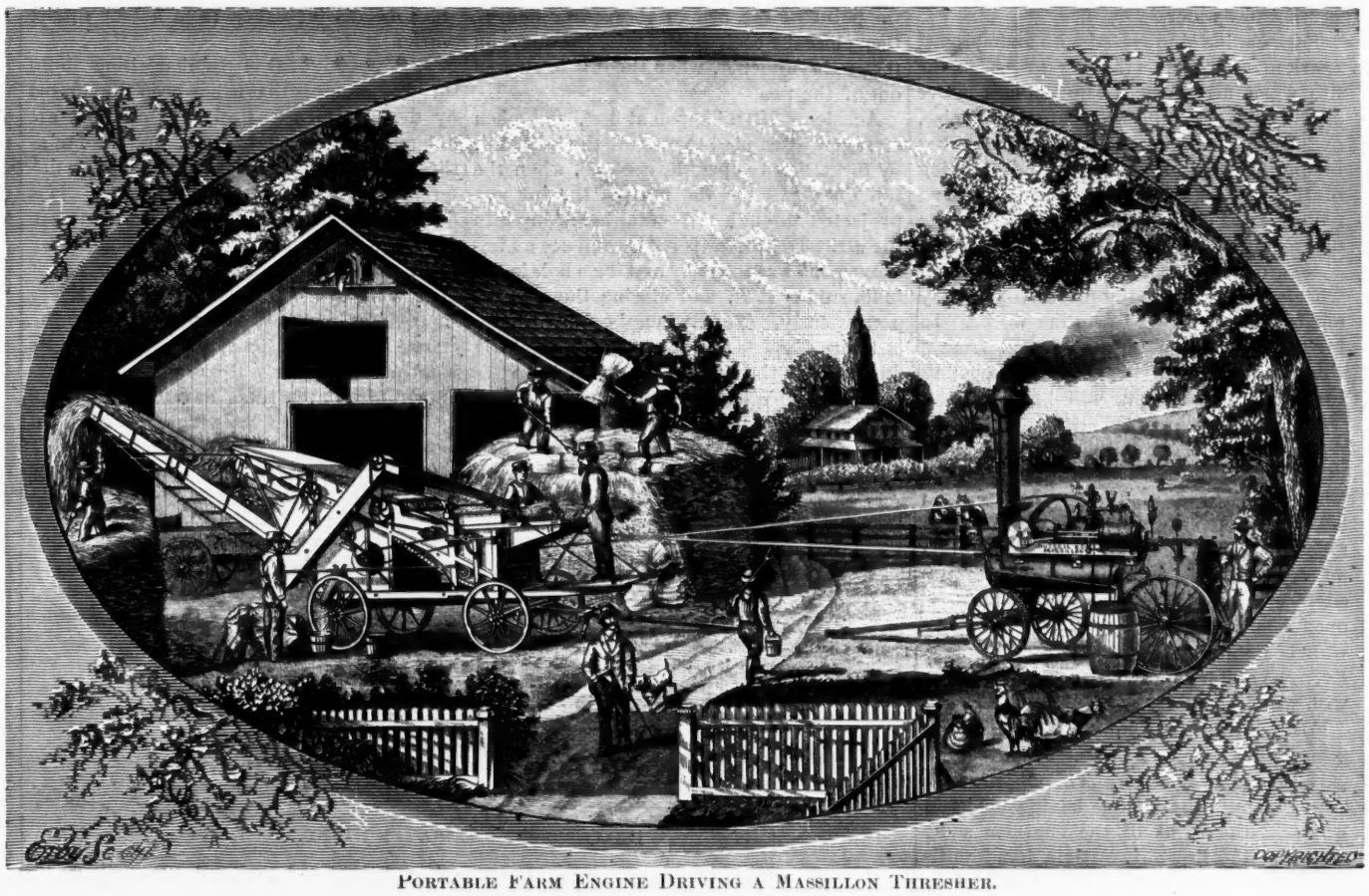
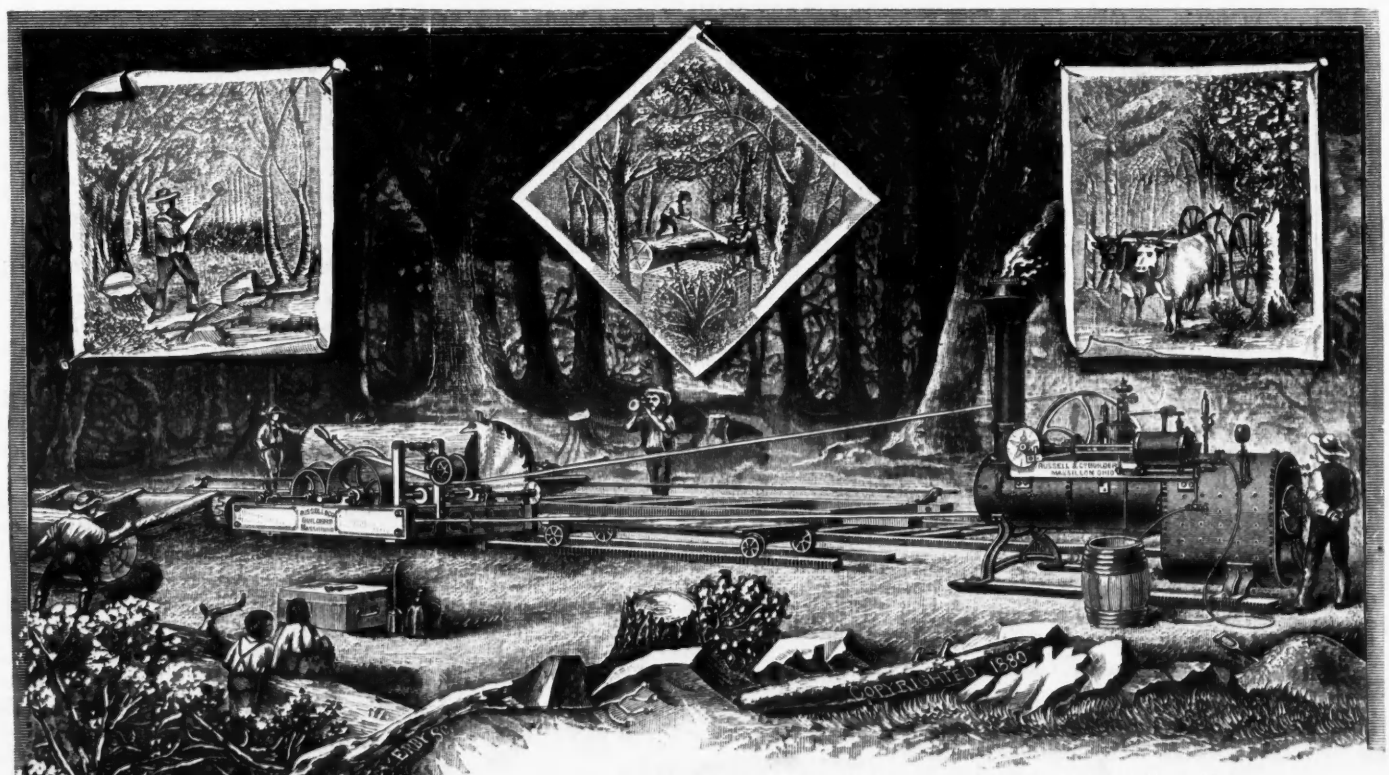
Portable Engines for Driving Saw Mills and Threshing Machines.

Many of the builders of portable farm engines seem to consider rough work and cheap materials, as good enough for this kind of machinery. Refinements, in their estimation, are thrown away if placed upon an agricultural engine. There are, however, some noticeable exceptions to this policy, one of which we have occasion to present in reference to the two artistic engravings upon this page. The first of these represents a "Massillon" thresher, driven by a portable farm engine, designed and built upon the very sensible assumption that such machinery deserves as much care and consideration to make it safe and serviceable as steam machinery intended to furnish power to manufacturing establishments. Symmetry of proportion and thoroughness of construction, with careful attention to the least as well as the greatest details, coupled with extra caution in the choice of materials, have evidently combined to render these engines very efficient, substantial and popular; the demand for them being something extraordinary. They are built in three sizes—ten, thirteen and sixteen horse-power respectively, and of both the portable and traction styles. All are constructed upon the same plan. The portable engine, with pedestals substituted for wheels and axles (as shown in the lower engraving), makes the semi-portable. The portable with changed wheels and axles, and with the traction gearing, is the traction engine. The builders, Russell & Co., Massillon, O., also make threshing machines of the kind shown in the upper engraving, and circular saw mills as shown in the lower one. The engines are used principally for threshing and for sawing lumber, the smallest engine being sufficient to run any threshing machine or a fifty-two inch circular saw mill.



PORTABLE FARM ENGINE DRIVING A MASSILLON THRESHER.



SEMI-PORTABLE ENGINE DRIVING A MASSILLON PONY SAW MILL.

Safety is considered by this firm the very first requisite, therefore the boilers are built at their own shops the better to insure that quality. They even make their own rivets and stay bolts from iron made especially for that purpose. The boilers are made with circular fire box and water front, which gives extra heating surface. Under the fire box the boiler is semi-circular, forming a fire-proof ash-pit, also a receptacle for sediment. The dirt can easily be blown off without blowing out all the water in the boiler.

The bed plate is cast with flanges, to attach it to the boiler; it is further supported by a center bracket, which adds to its stiffness; it is cast hollow, and into it the exhaust steam passes through the bed plate, thus heating the water before it enters the boiler. The exhaust steam is conveyed from the heater to the smoke stack, where it increases the draft and extinguishes sparks.

In addition to a good reliable pump for feeding the boiler, the necessary cocks and valves are provided for emptying the water when the engine is not running in cold freezing weather. A supplementary hose and nozzle also accompany the engine by means of which the pump can be used for sprinkling purposes, as for instance when raking the ashes or when about moving. The connecting rod, forged from best refined iron, is finished its entire length, and is provided with brass boxes, secured by gibs and keys in locomotive style. The cross head is of the locomotive pattern, and by means of a post works the pump rod. To prevent springing the slides are made extra stiff. Both valve rod and pump plunger are polished wrought iron, and the piston rod and wrist pin fire-forged steel, turned and polished. The steel main shafts are large enough to prevent springing, and long enough to admit of an extra band wheel. They run in brass boxes in pillow blocks, those on the crank end being provided with gibs and set screws to take up the wear. In order to secure uniform contraction and expansion the heater is arranged within the bed plate. The cylinder is lagged to prevent condensation and radiation. Grates

are designed for either coal, wood, cobs or cotton seed, burning any and all with good effect. Tubes are arranged in perpendicular rows, which leaves vertical open spaces for sediment to settle to the bottom of the boiler, so that it will not lodge upon the tubes but allow the globules of steam to rise directly to the surface of the water. Among the precautions for safety are the following: The parts are thoroughly stayed; tubes are expanded in extra heavy flue sheets; the holes are drilled carefully so as not to require copper ferrules to make the tubes tight; all riveting is done by hand, and a reliable safety valve is provided. As portable farm engines are often put in charge of men who are not engineers, or of careless men, fusible safety plugs are provided to protect against low water.

Each engine is provided with an improved spark arrester, and a blower to hasten the fire when necessary. The engines move steadily and smoothly with but trifling noise, and are so balanced as to require no other bracing or blocking than the simple locking of the wheels. Some engines of this class require extra clamping of the wheels to make them stand steady when running. These engines are mounted on either iron or wooden wheels, the former being preferred. Every one is tested before it leaves the works. In use the traction engine is changed from a simple threshing engine to a self-propeller, by moving a single spur wheel into a gear.

The lower engraving on the first page represents one of Russell & Co.'s pony saw mills, driven by their semi-portable engine. The sylvan beauties of the surroundings have been well portrayed by the artist. General contentment seems to prevail, as will be noticed in the complaisant attitude of the engineer, who is enjoying a smoke, and the open countenance of the "top sawyer," who is imbibing something from the jug. Even the children are regarding the scene with wonderment and admiration.

For sawing, the semi-portable engine is preferred as it costs less and has all of its parts within easy reach. The cut shows a left-hand mill, that is, one having the band wheel at the right of the engineer as he stands at the fire box. Right hand mills are those having the band wheel at his left. The top-saw attachment enables the operator to handle with ease the largest logs, and at the same time allow the use of a saw adapted to the power used. These mills have a capacity of from 3,000 to 10,000 feet of lumber per day. A ten-horse engine, with a good boiler, is calculated to make 3,000 to 5,000 feet a day. Each mill has a 30 foot carriage and a 60 foot track, unless otherwise desired. Many other special features about the engine and the saw mill are explained in the new and tasteful catalogue of the builders, Russell & Co., Massillon, O., from which the two engravings on our first page are taken.

Draughtsman's India-Ink Stand.

BY JOHN W. NYSTROM, C. E.

A good India-ink stand is much desired for mechanical and architectural drawings; its qualities depend upon the materials of which it is made, and upon its construction. The best material the writer knows of for India-ink stands is pure lead, which keeps the ink in better condition than does other materials.

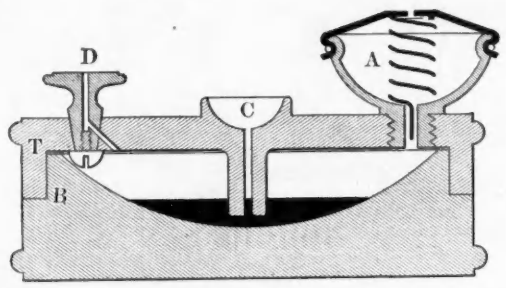
The accompanying illustration represents an India-ink stand, made of pure lead, at the Royal Technological Institute, Stockholm, in the year 1845, and as the writer has not seen anything like it in this country, it is thought worthy of a description.

The illustration represents a full size section of the inkstand, consisting of two principal parts, namely, the top *T*, and bottom *B*. The bottom is spherical concave, in which the India ink is ground and maintained in a fluid state. The spherical cup *A*, which is made of brass and screwed into the top, is covered with India rubber, pressed upwards in the center by a spiral spring. The cup *C* has a hole in the center, with a pipe reaching down into the ink. The joint *B T*, of the top and bottom, is slightly tapered and should be ground tight. The cock *D* is for letting out the air when the tap is put on, for otherwise the ink would squirt up through the center hole *C*. The cock *D* is closed after the top is put on.

When ink is required in the drawing pen, place the point in the center hole *C*, and at the same time press the india rubber at *E* with the little finger, and the enclosed air presses the ink up through the hole into the pen. The drawing pen should be wet inside and dry outside, when the ink is taken, and with good practice no ink should be raised into the cup *C* when the pen is dipped, and no ink should be on the outside of the pen.

When the ink is required to be sucked out from the drawing pen, open the cock *D*, press down the india rubber at *E*, and put the point of the pen in the center hole *C*; then close the cock *D*, and raise the finger on the India rubber *E*, when the ink is sucked out of the pen.

Accidents often happen at first, and when strangers attempted to operate the inkstand, by forgetting to open the cock *D*, when the top *T* was put on, the most of the ink was projected through the center hole *C* up into the air. To avoid this inconvenience an improvement was made by making a hole in the india rubber at *E*, and closing the cock *D*, permanently. Now, when the drawing pen is to be dipped, the pressure of the little finger closes the hole at *E*, and the ink rises to the pen. When the ink is to be sucked out, the little finger is placed on the india rubber so as to leave the hole *E* open. When fully pressed down, move the finger over the hole, then put the point of the pen in the hole *C*, and lift the little finger when the ink is sucked out from the pen into the inkstand.



DRAUGHTSMAN'S INDIA-INK STAND.

Care should be taken that no ink comes into the joint *B T*, and when such happens, it should be promptly washed and cleaned from ink. When strangers examine the inkstand, they sometimes turn it upside down to see how it looks underneath; and, of course, the ink enters the joint. To prevent this the joint was greased with tallow, but that practice is now abolished and better care taken that the inkstand is not handled by strangers. The joint *T B* is so nicely made that it can hardly be seen from the outside, and when strangers have taken hold of only the top part for lifting the inkstand, the bottom part has fallen and spilt the ink on the table or drawings.

The writer has used this inkstand for 36 years, and he would not now be contented without it.

A bill has been introduced into the Ohio Legislature providing that railroads which cross each other shall not do so at an even grade, but that each shall go either over or under the other. It ought to become a law.

The Railway Age has an editorial in a late issue headed "Let the Railways be Heard." Those residents of the upper portion of New York City who are kept awake at night for hours at a time, by screeching whistles and escaping surplus steam, think such an admonition entirely unnecessary. The railways are not timid about being heard.

An exhibition of agricultural machinery and forestry appliances, will be held at Hanover, Germany, from July 16 until July 24 next. A special line of rails will connect the exhibition with the railway station. Besides numerous medals, diplomas, and honorable mention, a large sum has been reserved for awards.

Extracts from Chordal's Letters.

HOW SHALL MECHANICAL DRAWINGS BE MADE?—THE MEN WHO USE DRAWINGS—DRAWINGS THAT NEED TO BE EXPLAINED AND THOSE THAT EXPLAIN THEMSELVES—COLORS, SHADINGS, DOTTED LINES, ELEVATIONS, END VIEWS AND SCALES—UTILITY OF ISOMETRICAL PERSPECTIVE.

Mr. Editor:

* * * * Two questions pertaining to mechanical drawing have been under discussion in your columns for some time past, and I suppose the matter is not ended yet.

The questions are: First — How should two elevations be located with reference to each other? and Second—How can round work be distinguished from flat or square work?

* * * * * One peculiar thing about this discussion is that it has been conducted by draughtsmen entirely. Drawings are not made for draughtsmen, and as far as they are concerned it don't make much difference about the style of drawing. If a drawing is fairly made a fair draughtsman can, by a little study, extract the intention from them. Drawings are for the use of men who are not draughtsmen. Every shop man knows that every shop, in the course of its operations, shows many of its workmen their first drawings. The machinist hired to-day has never worked from and has never seen drawings, but he must work from them to-morrow.

If the drawings are full of technicalities the new man may, some day, master them; but the main object is to have the drawings and the men develop instant utility.

* * * * Many of the plans lately unfolded in your columns are based on arbitrary technicality, which must be learned before the drawings will tell anything.

I have worked as a draughtsman myself, not as an amateur but as a paid man skilled in the art. As a draughtsman I have examined some of those proposed devices for indicating the shape of things drawn, and I declare to goodness that many of those devices conveyed no idea whatever to me without reading the accompanying argument. In other words, a man invents a self-explaining plan and then has to explain his invention.

* * * * I have fussed and fooled with detail drawings considerably, and I have long since concluded that drawings are indispensable in a well-managed shop (anything is dispensable in a poorly managed one), but that there is no necessity for the presence of a draughtsman to explain them.

I believe it possible to hire a machinist who never saw a drawing, give him a drawing, tell him to work to it, and to have him make what is wanted without further questioning.

I believe it possible to send drawings a thousand miles away, to parties unused to drawings, with no written word of explanation, and get what is wanted. Most drawings are useless in the hands of one unaccustomed to drawings, and even such parties must be capable of figuring out the system of elevation and projection, and section, and shading, followed by the author of the drawing; and the author of the drawing, when he was making them, probably asked himself a hundred times, "What is the 'practice' in regard to drawings in that shop?" when, in fact, there may have been no "practice" at all.

* * * * I define a working drawing as an illustrated memorandum of form and size, to guide an artisan in his manipulations. It must answer every possible necessary question. What shall we say of an artisan gazing vacantly on a "working drawing," and saying, "This drawing tells all I want to know, but how am I to know what the drawing tells?" The draughtsman would say the artisan did not understand his business, but I would say that the draughtsman did not understand his.

Working drawings are for the artisan, and must be in the language of the artisan.

* * * * A pattern maker is, of necessity, a sort of a draughtsman as much as a sort of a carpenter. A drawing which would be self-explaining to a draughtsman would be all right for a pattern maker to work from. Drawing, or a knowledge of drawings, forms no essential part of the machinist's craft as it does of the pattern maker's. When drawings are finished to the satisfaction of a draughtsman, it is always proper to ask if they will be satisfactory to a machinist.

* * * * Many draughtsmen, artists though they be, learn their business solely from the books instead of from their judgment. They learn the simple and useful meaning of the words "elevation," "plan," "section," "longitudinal," "transverse," etc., etc., and they improperly use these words properly, on drawings intended solely for the use of men who never saw their books.

Not one workman out of a hundred knows what the word "plan" means. The word should never be put on a shop drawing. Not one in ten knows what "section" means. Every draughtsman don't know what the word means. The word should never be put on a shop drawing.

The same may be said of almost all the technical words of the art of drawing. Not one machinist in ten knows what the "pitch" of a screw means.

The arbitrary colors specified in the books as indicating character of material should never be used on shop drawings, for not one shop man in fifty knows anything about them.

When I say should not be used, I mean that, while of course they do no harm, these things are useless for the purpose, and if they are the only guide, the drawings are just that much deficient.

* * * * Shading, and line hatching, and shadow development, to bring out surface shapes are among the beautiful technicalities of the draughtsman, but are absolutely nothing to the average machinist.

An end view placed in "proper relation" to an elevation, contains a world of information to a draughtsman, but to the new machinist it is simply a "draft" of something else.

* * * * Some draughtsmen follow the vicious plan of showing two views of everything and covering everything up with a lot of unnecessary dotted lines, and having the job half done at that.

* * * * A safe rule in regard to the number of views is to make what is necessary and no more. Show twenty views of one piece if it will tend to make things plainer to a man who don't know anything about drawings, but never put one view or one line on a drawing which is not absolutely required by such a man.

* * * * Line shading on working drawings, as done by most draughtsmen, is a humbug, whose only purpose is to exhibit the draughtsman's lack of skill and to puzzle the man who may have to use the drawing. The average line shading is beautiful to me, and I suppose it is to almost any draughtsman, but it is easy to see that it is out of place on a shop drawing, when the self-evident parts are carefully shaded and the doubtful parts left unshaded. It is the custom of most draughtsmen to do this. They undertake something they are incapable of, and, as a consequence, are compelled to leave the work unfinished. Most draughtsmen in making "working" drawings will carefully and nicely shade a plain piece of shafting, or something of that kind, whose shape cannot be mistaken anyhow, and a complicated cast-iron shape on the same drawing will be left unshaded. Why? Because the draughtsman don't know

how. Not one draughtsman in ten knows how to put line shading on work, except on plain pieces which need no shading. In my own work I do no line shading, for two reasons: First—I don't know how; and Second—the man the drawing is for would be bothered by it if I did know how.

* * * * The scale of a drawing is unimportant, so long as the drawing is not made inconveniently large to handle, or the work confusingly small. Some work may be one-twentieth size, and some work must be drawn ten times the natural size. Full size is a bad size for a drawing, as it tempts workmen to be measuring views instead of working by figures, which are the same every time.

* * * * Few draughtsmen seem to be alive to the utility of isometrical perspective. Many suppose it hard to do. It is no more difficult than plain work. It requires a single special tool, viz., a thirty degree angle. It permits a single, simple, easily-made view to exhibit a shape which a dozen separate elevations, sections, etc., would fail to show. In complicated pieces it is much easier to make one perspective view, than to make the requisite number of elevations. I think the art of isometrical perspective drawing can be acquired in five minutes by any draughtsman. Isometrical perspective, unlike true perspective, permits actual measurement in three directions, length, width, and thickness. A miniature perspective view of a thing will often throw a world of light on a shape in connection with numberless vain endeavors to bring it out by sections, plain views, and shading.

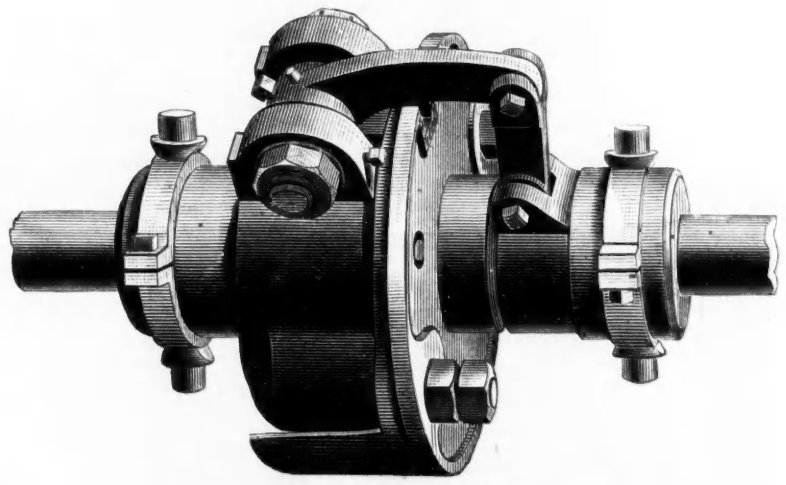
* * * * I will try soon to send you several drawings of a simple piece made on the different plans suggested by your correspondents, and their relative merits can thus be studied.

* * * * Very respectfully,

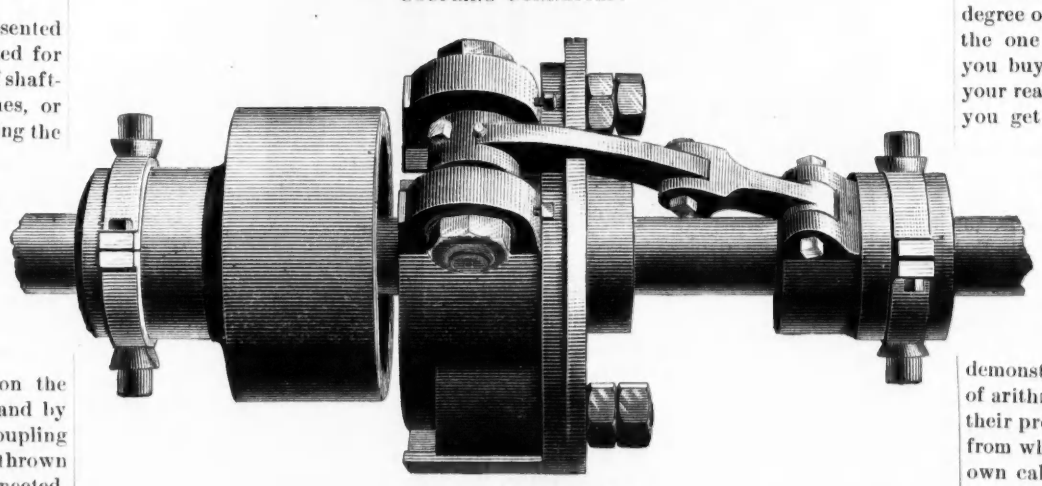
CHORDAL.

Friction Clutch Cut-off Couplings.

The friction cut-off coupling represented by the two cuts upon this page is used for connecting and disconnecting lines of shafting, water wheels and steam engines, or other heavy machinery, without slacking the speed of motive power. The friction clutch as shown, has a right and left hand screw which passes through the ears of the friction band. This screw is turned so as to contract the split ring by the action of the toggle when the collar is moved toward the coupling, thus enabling the exertion of great power in contracting the band upon the friction surface of the sliding hub, and by moving the collar away from the coupling to release it. The sliding hub is then thrown out of the friction band when disconnected, thus avoiding any wear on friction surface when not in use. The friction clutch is adapted to either light or heavy work. They are in operation from 5 to 300 horse power. J. Hunter & Son, North Adams, Mass., are the manufacturers.



COUPLING CONNECTED.



COUPLING DISCONNECTED.

The chameleon is a reptile, whose color changes more or less with surrounding objects, or with its temper when disturbed. Some great corporations seem to possess, among other extraordinary powers, that of chameleonizing themselves. "I have always noticed," says the treasurer of the Anti-Monopoly League, "that when great corporations have been asking privileges from the public, they put forward their public nature very prominently; but when it comes to performing their *duties* to the public, they generally claim the privilege of private citizens."

Langdon & Co., of Minneapolis, Minn., have secured the contract for building an extension for the Chicago, Milwaukee and St. Paul Company from Marion to Council Bluffs, a distance of 207 miles. It is hoped to complete the line before snow flies next fall.

Misrepresentation.

BY F. F. HEMENWAY.

If there is in this world any one thing more utterly demoralizing than another, in its effects on the average prospective purchaser of machinery and supplies, it is unreasonable representations. If there is any class of individuals who, more than another, appreciate the effect of this demoralization, and who get right hold of it and work it for all it is worth, it is the average drummer in these lines. If a man buys five thousand feet of gas-pipe, or five hundred elbows, or tees, or fifty globe valves, or an indefinite quantity of other fittings, he buys at a big price, and he gets a large discount. The price is a matter of no consequence. The discount influences the bargain. The price bears about the same relation to the subject that the text bears to the sermon. It indicates that something of interest is to follow. If he buys boiler tubes, or governors, or safety valves, or indicators, or steam traps, the discount is there all the same, but it assumes more moderate proportions. The price has some influence on the transaction. There isn't much excuse for discounts of seventy-five per cent., or eighty per cent. They are misleading in their effects, and there is no reasonable argument for their use. There is some reason in affixing to such products a regular market price—high enough to cover any probable attainable value—and meeting the fluctuation in price by modifying discounts to correspond. It saves new price lists, and as the buyer has to pay for them it (presumably) cheapens the article. On the whole the buyer isn't particularly directly affected by these remarkable discounts. The discount is his price list, and the price list something which goes with it. Indirectly, and in an educational point of view, it does affect him. It has its influence in leading up to the calling of things by names that don't belong to them, and it assists in educating people up to tolerate their being so-called. If a man hasn't any moral right to grumble at the amplitude of the discount list, he has a reasonable right to expect to get what he contracts for. He may with some reason object to getting a ditching machine on an order for a corn sheller, or a damper regulator, when he negotiated for tube scrapers. There are some rights left the purchaser, which the seller is bound to respect.

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There are twenty steam-engine governors in the market that are "Perfect." Some of these are good, some are bad, and others are indifferent—that is they haven't got enough originality about them to be one or the other; but they are all known, and made and sold under the name and style of "Perfect." If a man knows anything to speak of about governors, he knows you couldn't make a perfect one, and he knows he couldn't use one if he had it. If he buys one as perfect, and it won't govern his engine within 40 revolutions, has he any recourse in point of law; or would an intelligent jury hold that a party can't contract for an impossibility? There are a half dozen other governors that are advertised and sold under the name and title of the "most perfect." Would a like intelligent jury decide that the attempt at qualification was proof that perfect didn't mean perfect at all, but that it meant something else, or didn't mean anything. If it could be demonstrated that a perfect governor would be useless, would it be held that a perfect governor (so-called) was one which perfectly fitted the imperfections of a perfect steam engine; and that a "most perfect" one was one in which the perfect imperfections of the engine and governor got a little closer in sympathy? A great many individuals who have bought, or used, or witnessed the operation of this useful steam engine adjunct have been puzzled to understand the exact meaning of the term perfect as applied to a governor. Will some one explain? Suppose some conscientious individual were to manufacture and offer for sale a *good* governor. Suppose he were to duly set forth his appreciation of the fact that even a governor couldn't be got outside physical laws; and that paying proper respect to these laws, and exercising such skill and judgment as a careful consideration of the subject enabled him to exercise, he had by the use of fair material and reasonably good workmanship succeeded in producing a *good* article? Suppose he were to go before the public with this declaration, could he sell his productions? If a party in search of good results buys a "perfect governor," and it won't govern within fifteen per cent., trades it for a "most perfect," and that is five per cent. worse, will he look with anything like favor on a *good* article? I don't say he won't. I am inclined to think he will. He might be inclined to test the effect of buying more governor and less representation.

There are a number of things besides governors that are sold on something beside their merit. If you buy a special machine tool, guaranteed to produce a definite effect in so many days, or hours, or minutes, do you expect to get the identical results guaranteed? Nine times in ten you can't do it—not with any intelligence you can hire. If you get average results within twenty-five per cent. you are fortunate. There probably is somewhere an individual who has done it, and who can do it again, if you let him select his stock and make his opportunities, and keep his own time. You can't find the second man, and you can't hire this one. He isn't a workman, he is an expert. He was born and educated for that special purpose, and he sticks to it. So far as a common-sense understanding of the question is concerned, the guarantee is a failure. You have bought a machine, and you have bought a big guarantee. You get the machine and you get seventy-five per cent. of the guarantee. That other twenty-five per cent. may have been the inducement to buy. It may have been all that made it advisable for you to own and use such a tool; or it may be that, with all its shortcomings, it is so far ahead of your usual process as to be satisfactory on general principles. If the first-named conditions exist you consider yourself beat, and you are beat. If the second, you are beat all the same, but you don't give it any consideration. There are parties who manufacture machinery, and there are parties who manufacture representations. The first will sell you their products with such plain statements of merit as they know them to possess. The second will sell you extravagant guarantees—and their products. In the one instance you don't get the degree of anticipation you do in the other. In the other you don't get the degree of realization you do in the one. In the one instance you buy good work and you buy facts, and your anticipations and your realizations meet evenly. In the other you get "great expectations" and poorer work. The first may disappoint you occasionally by delivering better than they sell. The second will disappoint you every time by delivering poorer than they sell. The first give a stability to mechanical industry, and they help to establish the business of the country on a mathematical basis. You can demonstrate by the four fundamental rules of arithmetic the result of buying and using their products. They give the buyer a basis from which to calculate, and he makes his own calculations, and he buys or he don't buy just as it figures. The second don't give stability to anything, and they don't help to establish anything. If you get their representations steady long enough to make any calculations from them, and if you are unwise enough to do so, the most you know is that you don't know anything of the subject at issue.

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There are correspondingly two classes of buyers. The first buy, and they expect to get what they contract for. The second buy, and they delight in being humbugged. If you sell to the first, and deliver what you agree to, and when you agree to, there is nothing but pleasantness in the transaction. You can't sell to the second, unless you agree to reverse all known physical laws bearing on the subject. If you offer them your products as being of the earth, earthy; if you candidly tell them your machines will wear out, and break down under sufficient provocation, and that for all you know some one may make an improvement on them, and that they won't be any better in ten years than they are now, they won't buy. They want the goods, but they want an indefinite quantity of humbug with them; or they want the humbug, and tolerate the goods. If you guarantee them something that will be perfect in the begin-

ning, and considerably better after twenty years' use, something that *can't* break down, or wear out, or be improved upon, and deliver faulty design, poor material, and poorer workmanship, it seems to be all right.

The class of men who sell guarantees and the class of men who buy them, constitute an important part of mechanical society. You can't eliminate it by legislation. You can't enact statutes which shall prohibit them from diluting their machinery with any amount of ponderous representations or misrepresentations. You can only convert them. If they didn't get mixed with the class who buy and sell from solid facts, it wouldn't matter much; but they do get mixed with this class. The honest buyer isn't always an expert in the line of his purchase, in which case he generally finds it expedient to place that particular part of his business in the hands of an expert. If you could convert either element of this objectionable part, the other would cease to be operative. If there ceases to be a market for impossibilities, impossibilities will cease to occupy the market. It is sometimes a great moral problem whether the man who gets humbugged, or the party who humbugs him, is the most to be blamed.

If a party builds a lap valve steam engine, and if he knows enough, and is well enough disposed to design it properly and build it honestly, he may have a legal right to recommend it to me as equal in economy to the best cut-off engines, but he hasn't any moral or educational right to so recommend it. On the other hand, if he builds high-toned automatic engines, and if he gets them up on correct economic principles, he hasn't any decent right to recommend it to me as fifty-per cent. or sixty per cent. better than some first-class lap-valve engine. If he does so recommend it, he ought to be subjected to some corrective influence for selling. Query. Should I deserve the same treatment for buying?

Stove Plate Grinding Machine.

The machine for grinding stove plates, herewith illustrated, is constructed with iron frame, securely fastened to make it rigid. To the main frame is attached a cross frame to hold the sliding sash that carries the mandrel and pulley. The sliding surfaces of the sash and frame are planed true, and the sash is held in place by beveled gibs that can be adjusted to take up wear. The mandrel is set at an angle of about the average of edges of plate to be ground, so that the work rests on a horizontal table. To suit varying angles, however, the table is adjustable, being hinged on a line with face of wheel. The table is raised and lowered by screw under front side, and held firmly by straps and screws on each side.

The sash and mandrel, on which is used a straight-faced wheel, are slowly traversed up and down by connecting rod and crank, to which motion is transmitted through worm gear and counter shaft attached to the frame, which is driven by belt from main counter shaft. The throw of the crank is adjustable, so that the motion may be made equal to excess of face of wheel over the width of edge to be ground, and the length of connecting rod is adjustable to suit the varying positions of the work on the table. Thus the entire face of wheel is brought in contact with the work, and the slow, but constant traverse, prevents the scoring of the stone and insures a true surface on the work. In case it should be desirable to stop the traverse motion, a loose pulley and shipper are provided in connection with countershaft.

The mandrel step is composition, and has a large oil chamber. The upper bearing is designed to be extra quality babbitt metal, and is oiled through hole extending to top of mandrel, and provided with screw plug. The table is 36 x 40 inches, and has an extension piece 10 x 40 inches that can be used on either side.

Points, for which special advantage is claimed relating to this machine, are the traverse motion of the mandrel and wheel, and the use of a square-faced wheel instead of a cone. By the up and down motion of the wheel, the grinding is done on the entire face, thus keeping it true, and avoiding the liability of wearing for hours at a time in one particular spot, caused by the carelessness of workmen.

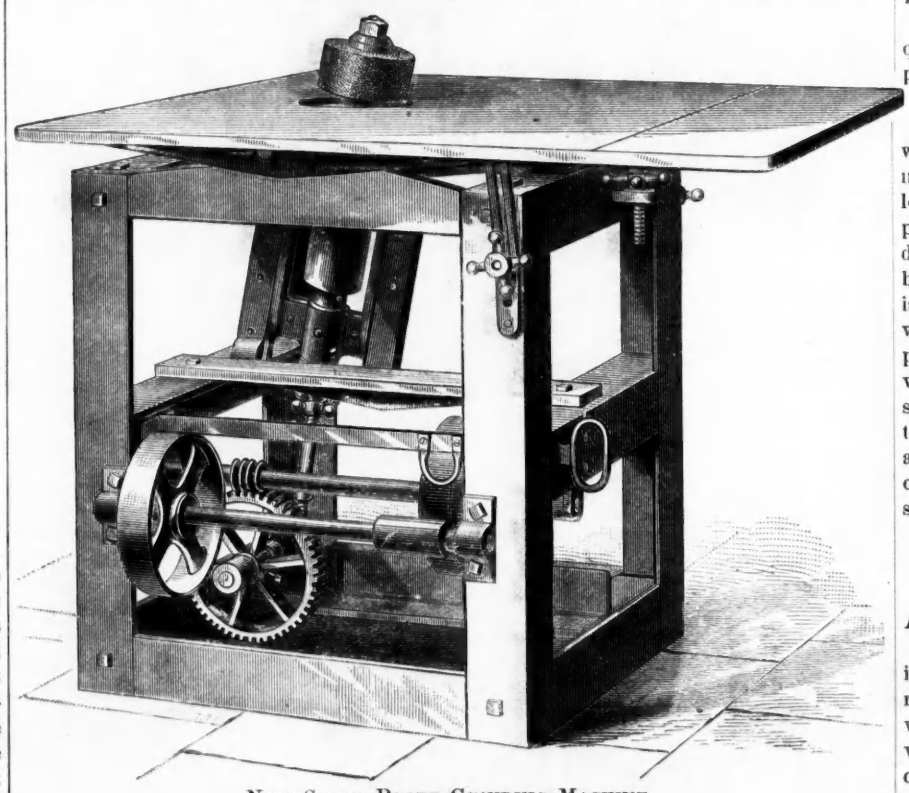
The inclination of the shaft, instead of the table, permits the use of a flat or level table, making the holding of the work much easier for the workman, in view of the constant tendency of the wheel to knock the work away.

This machine is manufactured by Taplin, Rice & Co., Akron, Ohio, for the Lehigh Valley Emery Wheel Co., Weissport, Pa., Cooke & Co., 6 Cortlandt St., N. Y. Agents.

New Small-Power High-Speed Engine.

One of the chief objections to the introduction of electric lights into stores and large buildings has, heretofore, been the space required for the engines and machinery. There has also been much difficulty experienced in obtaining an engine adapted to the purpose. An engine, to meet the requirements, must occupy the least possible space and be capable of developing the necessary power to drive the dynamo machines.

The engine represented by the engiaving



New Stove Plate Grinding Machine.

on page 5, was designed for application where small power is required to drive machinery, but more particularly for running dynamo machines for electric lighting. It has a bed of particular design, light, but very strong, the distribution of metal being made according to the best modern practice of engineering, to accomplish the best results. The guides are bored true with the cylinder which overhangs, and is free from the distortion sometimes caused by unequal expansion.

The crank is formed by two discs joined together by a stout steel pin. By placing a pillow block upon either side, the journals are free from the tendency to heat which exists upon many high speed engines, having a pillow block only upon one side. The valve motion consists of a plug piston valve accurately fitted and ground to the seat, the process being conducted in a manner which prevents any emery from becoming imbedded in the pores of the metal, which would soon destroy the surfaces. The valve is worked by a single eccentric, which is loose upon the shaft, being attached to, and adjusted by, the governor levers, as shown, connected with the fly wheel. The speed may be varied by adjusting the weights upon the governor arms, the weights being held in equilibrium by a stout steel spring. Should an accident occur to the governor, the engine is protected from injury and from running away, by a simple safety device attached to the eccentric, as shown. In practice, two fly wheels are generally used, the one in this case being removed to show the construction of the engine.

The moving parts are provided with suitable oiling devices, by which all parts may be flooded with oil if necessary, without reducing the speed of the engine. All the parts are adjustable to compensate for wear. The reciprocating parts are accurately balanced, so that when the engine is running at the speed for which it was designed, there is little or no jar, and the bearings run cool. The stuffing boxes, and in fact all places likely to require manipulation or attention, are easily accessible.

A 5"x7" engine of this class is now running at Thos. A. Edison's laboratory at Menlo Park, N. J., and has run seventeen consecutive hours driving one dynamo machine with sixty lights attached.

The size of engine named is capable of easily developing about ten horse power, as may be seen from the accompanying diagrams which were recently taken from a 5"x7" engine, running at different speeds. Fig. 1 was taken with a fair load attached, Fig. 2 the same at a higher speed, while Fig. 3 shows a very short cut-off at 590 revolutions, and very much resembles a locomotive card taken at a high speed. These engines are built by B. W. Payne & Sons, Corning, N. Y. E. P. Hampson, 91 Liberty Street, New York, is sole agent.

LETTERS FROM PRACTICAL MEN.

Molecular Physics.

Editor American Machinist:

There is no branch of science more interesting to the student, or more profitable to an earnest, expert physicist, than the science of molecular physics. I do not mean the science of physics, which is the science of objects, and treats of the general properties of bodies, and causes of phenomena; but I mean that metaphysical science, which goes beyond the object, and deals with the indistinguishable molecules, and the atoms of which they are composed. But why bring this subject up in the American Machinist? Because the atom is the boiler, and the molecule is the great caloric engine by which the energy of the universe is utilized. Think of the waste of caloric in our steam-engine system, in which we scarcely utilize 11 per cent., and waste 89 per cent. of the heat units contained in the coal we burn. "Go to the ant, thou sluggard," may be sandwiched with "go to the molecule, thou prodigal," and learn some of the laws relating to the economy of energy.

Mechanics and engineers are continually dealing with iron and steel. The metal sometimes breaks. When it does break, it is not a rupture of the ponderable matter, because it is an undisputed fact in science that no two particles of matter ever touch each other by absolute contact; when the metal breaks, it is a rupture of the invisible imponderable physical force, which holds the molecules near each other. The metallurgist, may, by the study of molecular physics, learn to make tougher, stronger, and cheaper iron, steel and other metals, and there the engineer may learn to use them to better advantage.

It is pleasant to look upon the snow-capped hills, or to see the golden grain waving in the gentle breeze. It is glorious to watch the rising or the setting sun, or view the heavenly bodies in the shades of night; but it gives me greater joy to watch the "*vortex atoms*," as portrayed by Helmholtz and Sir William Thompson. For fear that you might say that I am too theoretical, allow me to add that I have, by the study of molecular physics, made an important discovery in metallurgy, from which I have already realized $5,000, and will get much more; so, I say, for pleasure or for profit, study molecular physics.

Jacob Reese, M. E.

Pittsburgh, Pa., March 24, 1881.

Hardening Large Pieces of Steel.

Editor American Machinist:

I note in your issue of April 2d an inquiry from J. C. B. how to harden steel and prevent checking or cracking.

Fill a crucible or iron vessel, large enough to hold the article to be hardened, with lead, and place on a fire, or better still, in a brass founder's furnace. When the lead is in a molten state, place the piece or pieces of steel in the vessel in a perpendicular position. Fire up, until the steel is heated through to a blood red. If the steel is hard tempered, get a vessel of water just warm. Take the steel out of the lead, and place it slowly and perpendicularly in the water. If the steel is of a soft temper put some salt in the water. I have hardened taps, reamers, etc., up to 5 inches diameter, and 3 feet 6 inches long, in this way, without a fracture, and kept them perfectly straight. W. B.

Boston, Mass.

Random Raps at Practical Men.

Editor American Machinist:

I cannot agree with "Norman," in your issue of the 26th ult. (although I have great respect for his ancestors), that our skilled workmen are to be brought from across the water; many good mechanics, however, come from abroad. To make a good workman depends much on the treatment of the apprentice; although the make-up of the boy has much to do with his future outcome.

Seventeen, I consider the proper age to commence an apprenticeship, and the term should not be for less than four years.

I don't believe in parent or guardian signing the contract binding the apprentice; this takes from him his individuality.

The best restraining influence is to retain a portion of his wages each week, to be paid at the expiration of contract, provided the same is faithfully complied with.

Foreman and employer, I fear, too often underrate the ability of the apprentice, find much fault, scold, and seldom, if ever, give a word of encouragement when it is deserved.

A certain apprentice had worked nearly a year before any better job was given him than to run a small drill press, chip off castings, or coal-tar rough machinery.

One day while the proprietor was absent, he went to the scrap pile and found the hub of a wheel which had been bored, but had no keyseat in it; we had no slotter in those days; so he procured a cape chisel and proceeded to cut a keyseat. He had nearly finished when the foreman returned, and inquired what he was doing. He told him he was just seeing if he could cut a keyseat.

This gentle reproof had the desired effect, and never afterward had he any reason to complain about not being advanced fast enough.

Another apprentice went to the foreman

a short time after this, and in a very insolent way demanded a promotion, which resulted in his disappointment and final discharge.

Now, a word as to the "dirty" aspect of the machine shop, foundry, or blacksmith shop. Norman strikes a vital point just here.

The writer would never have selected the machinist trade if he had taken the advice of his friends, their only objection being, "it is such a dirty, greasy trade."

It may be well to view the subject from this side, and see what there is in it.

Self-respect has much to do with the formation of character. However well clothed we may be, we are never dressed until our boots are blacked. The apprentice should always wash up before leaving the shop, and protect his clothing well while at work, so as to look neat and clean on the street. This, together with good manners, will take him into the best society, and make him an ornament to his profession.

I have noticed a marked difference between Eastern and Western mechanics, with regard to their neatness when on the street. I must not be understood by this to mean the use of beavers or kid gloves, or any other foppish extravagance.

A school for instruction in drawing is not absolutely essential to the acquirement of that accomplishment.

The apprentice should invest his first spare earnings in a case of drawing instruments, and the needed instruction will always be readily found.

We have good reason to believe that the general introduction of scientific literature into the workshop will have the effect of giving to the country a higher order of mechanics and second to none, from whatsoever country they may come.

There is more of this than I intended. A word now as to "Plank Check's" coupling.

I am either thick-headed, or he don't make clear his plan. I don't like any coupling that requires being keyed to the shaft; neither do I like the "elastic" principle, unless it be to counteract backlash, as in a mill spindle.

workmen who pay not the least regard as to how a tool should be ground to do good service. A hasty examination of some of the tools, as they lie on the lathe board, will convince the intelligent workman of this fact, that many tools are carried to the grindstone to be ground, but from want of knowledge of the art of properly grinding the tool, are brought back unimproved, and one by one placed in the tool post, ready to wrestle with the article to be operated upon, and the power which is struggling to overcome the combativeness of the tool. Now and then the belt slips from sheer exhaustion. How often this happens in the workshops need not be told to the mechanic, who, often out of sympathy for the operator, now and then gives him a few points in grinding a tool, so that it will not require more than one-tenth the power to properly do the work. More than one-half of all the wear and tear and breakage, and bother of dull tools, comes from a lack of proper knowledge and practice in grinding. All steel, however highly refined, is composed of individual fibers, laid lengthwise in the bar, and held firmly together by cohesion. In almost all forms of cutting implements, the steel portion, which forms the edge, is laid in and welded to the iron longitudinally, so that it is the side of the bundle of fibers, hammered and ground down, that forms the edge. Hence, by holding on the grindstone all edge tools, as axes, drawing knives, knives of reapers, scythes, knives of straw cutters, or tools in general use by mechanics and workmen, in such a manner that the action of the stone is at right angles with the plane of the edge, or in plainer words, by holding the edge of the tools square across the stone, the direction of the fibers will be changed so as to present the ends, instead of the side, as a cutting edge. By grinding in this manner, a finer edge is set, the tool is ground in less time, holds an edge a great deal longer, and is far less liable to nick out and break. A little practice in grinding, with a knowledge of what the tool has to do, will in due time reduce the number of ugly looking tools so often found in the workshop.

C. E. SIMONDS.

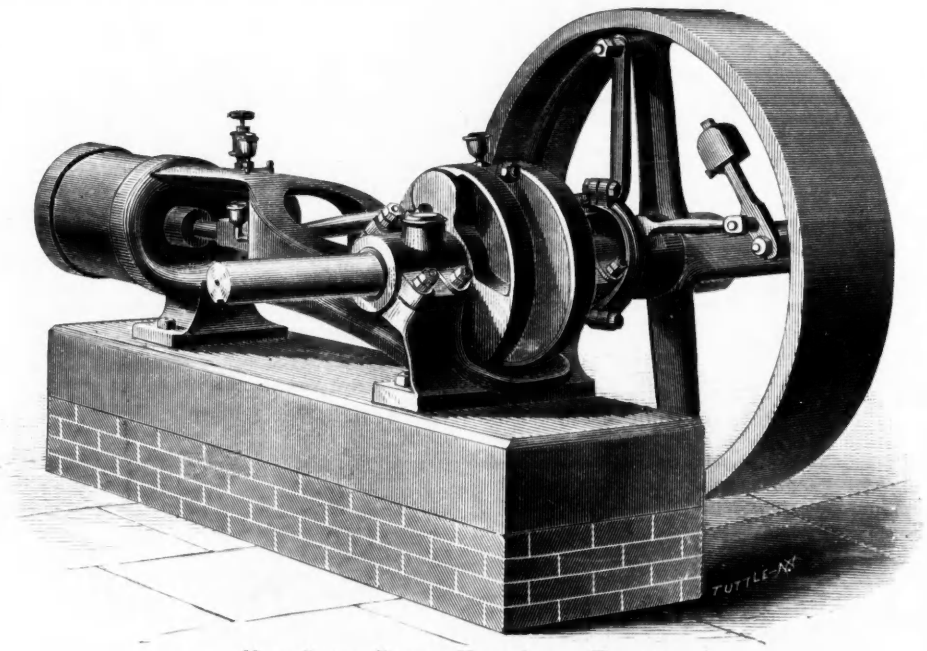
London St., East Boston, Mass.

A Rickety Engine. — Cutting Small Gears, etc.

Editor American Machinist:

In your rambles among machine shops, engine rooms, etc., did you ever come across a case of "crookedness" like this? It is on an old pattern Wright automatic cut-off engine; eccentric running the exhaust valves and gearing, and cam movement, running cut-off valves. Dimensions about 28 inches cylinder and 4 ft. stroke, fly-wheel about 18 or 20 ft. in diameter, shaft 8 or 10 inches diameter. Now, that shaft moved longitudinally fully $\frac{1}{8}$ of an inch at each stroke. At the end of the stroke nearest the cylinder there was a "thump," and a big one; enough to cause the cylindrical (about 5 inches diameter extending from the pillow block to the front cylinder-head) to spring towards the fly-wheel in the middle nearly $\frac{1}{16}$ of an inch.

This engine is running in a large cotton mill in a town in the southern part of New Hampshire, and was built in Newmarket, N. H.



NEW SMALL POWER HIGH SPEED ENGINE.

* * * * Will the planer of the future make the heavy casting a ton or more in weight move back and forth 5 ft. or more, while that little tool, weighing 2 or 3 pounds, sits up there stationary? If it does who will call it progress?

Do any of your readers use the following method of cutting small gears, etc., in the lathe? Put the cutter on a mandrel between the centers, insert a square-headed bolt upside down in the place of the tool post (which should be removed); put the wheel to be cut over the bolt, as you would a washer, then put the nut on and screw the wheel down tight as you would a tool in the tool post. Now start the lathe and you can feed the wheel forward, backward, or any way.

By using a cutter of small diameter, gears of perhaps up to 10 inches diameter, can be cut on a lathe having a cross feed of 18 inches.

If there are none of your readers who have used this method of cutting gears (as I am the inventor of it), I would say that they can use it, one and all without fear of a royalty to pay or anything else, as it is not, nor is it going to be, patented.

To turn a mandrel, arbor, or taper in a lathe which has not the arrangement for setting over the tail-stock, take the wheel, or ball-handle, off the cross-feed screw, and in its place put a grooved wheel, the diameter of which can be easily determined. To turn an arbor 1 foot long, 1 inch in diameter at one end, and $1\frac{1}{4}$ inch at the other, on a lathe, the cross-feed screw of which has 8 threads to the inch, the diameter of the wheel at the bottom of the groove should be $3\frac{10}{11}$ inches. A wire cord is to be attached at each end of the lathe-bed, and wound once around the wheel and drawn tight. On starting the lathe, with the slide rest moving as for turning a cylinder, the taper will be pretty accurate. The cord can be slipped on the wheel when feeding to take another cut.

For boring a taper in a short ring where the common lathe tool (not the boring tool) can be used, this same plan can be used.

A little calculation, and a grade of wheels of different diameters will enable one to turn almost any kind of a taper.

If, instead of the cord and grooved wheels, a rack and gear wheels are used, the result will be all you can wish.

You must fix the rack so that it can be raised or lowered to suit small or large wheels; and have the wheels so that they can be moved out from the rack to feed on a new cut, by having the shaft of the screw made square, or with a keyseat, with the key in the wheel.

MAC.

Dorchester, Mass.

The Drawing Down of Green Sand Copes.

Editor American Machinist:

The surface condition of a green sand cope, while the iron is being poured into the mould, entirely depends on the mixture and nature of the sand, and the heat it is subjected to. Any section of a cope surface that is exposed to the direct heat of the metal for over 20 seconds, requires the sand to be strong and close and gaggered well, having as little sand under the gaggers as possible, to keep the sand from being drawn down. I noticed in a recent issue of the MACHINIST, the assertion made, that with a plate, 2″ or more in thickness, the cope will be baked hard as a brick by the intense heat before the iron reaches it. I only wish that such was the case, for it would save work and anxiety for the result of many large castings. I have made moulds in green sand that were not safe to cover with a green sand cope, and have covered them with a loam plate, fearing that the green sand would draw down. This is caused by the sand exposed to the heat getting dry and dropping down on the rising iron, which, when the casting comes out, shows lumps and sand holes in the cope part. There are several ways of securing a cope surface, to a great extent, from drawing down. For instance, mix some flour in your facing sand (about one to sixteen or twenty), or wet your sand with clay wash, and, before closing the cope, sprinkle the surface over with molasses water, boiled flour water, or beer.

Above everything, keep your risers and feeding heads air tight, so that there is no chance for the air in the mould to escape, except through the venting and the sand. Then the rising metal will compress the air above it sufficiently to keep the sand from being drawn down by the heat, if the mould

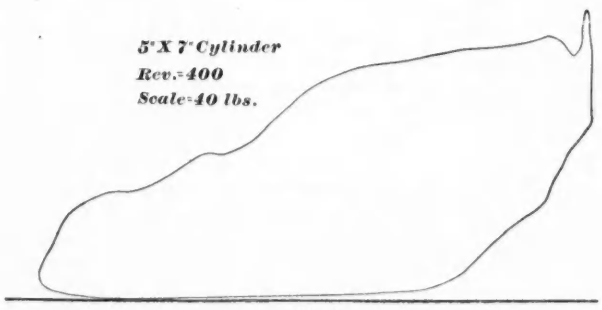


Fig. 1

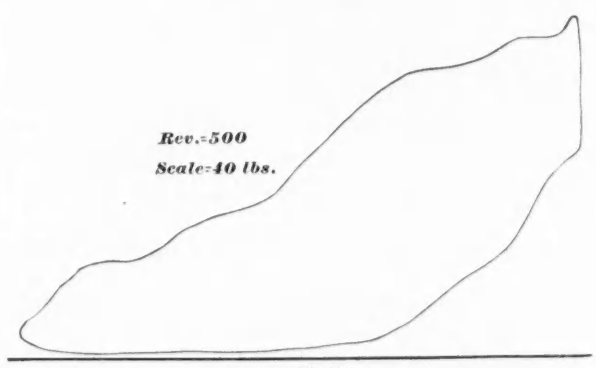


Fig. 2

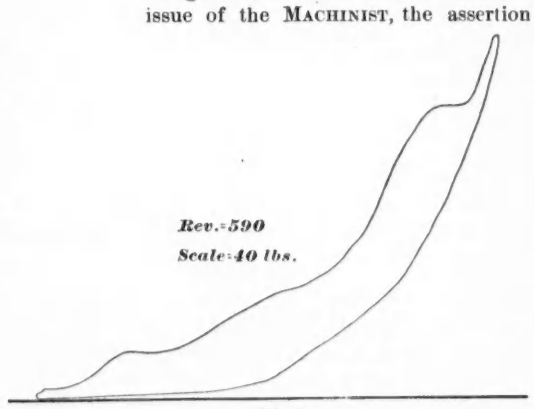


Fig. 3

As to pattern shop tools, I too, would think a lathe a poor place to work a grindstone. But I think the advice of Mr. Graham bad, as to employing a regular wood turner in the pattern shop.

The skill that enables him to turn a bedpost every five minutes, cannot be made available here, for the very nature of such work is to cultivate a disregard for accuracy, and yet with great precision approximate the given form for his work.

Besides this, it is best for a pattern maker to do both the bench and lathe work connected with the pattern in hand.

A cross feed, worked with screw, and made to swivel, is a convenience on a pattern lathe, and particularly in turning cant work such as pulley patterns. But I would not think a slide rest to shove by hand of any value. I don't remember if "Workman" included a band saw in his outfit. This is one of the most convenient tools a pattern shop can have.

Chattanooga, Tenn. QUIRK.

Art of Grinding Tools.

Editor American Machinist:

There seem to be a great number of

is not too long in filling up, so that the pressure is released by the air having time to escape through the vent holes and the sand. There is also such a thing as pouring a casting too fast, so as not to give the air a chance to escape as freely as it should, thereby lifting your riser cover and weights, and letting the air rush out and start your mould blowing. (At some future time I will give my views on pouring and venting moulds.) I have made castings where I have nailed the surface of the cope over with nails, keeping the heads about one-eighth of an inch below the face of the sand, and in some cases have had the nails even with the face of the mould, so as to insure the cope against being drawn down. When not feeling sure of this, I have made the facing sand strong with flour, and wet it with clay wash, and when the cope was finished, made it very damp with molasses water, building a fire with shavings and chips under the cope, until the surface of the mould was dried like a dry sand mould. When I thought that none of these extra precautions would keep a green sand cope from getting dry or burnt, I would then use a loam or dry sand cope, or covering. Thos. D. West.

Cleveland, Ohio.

High Speed Locomotives.

Editor American Machinist:

The deep interest which attaches to the subject of rapid transit, and the remarkable samples of high-speed locomotives which are now under trial, lead me to present the following modification and considerations.

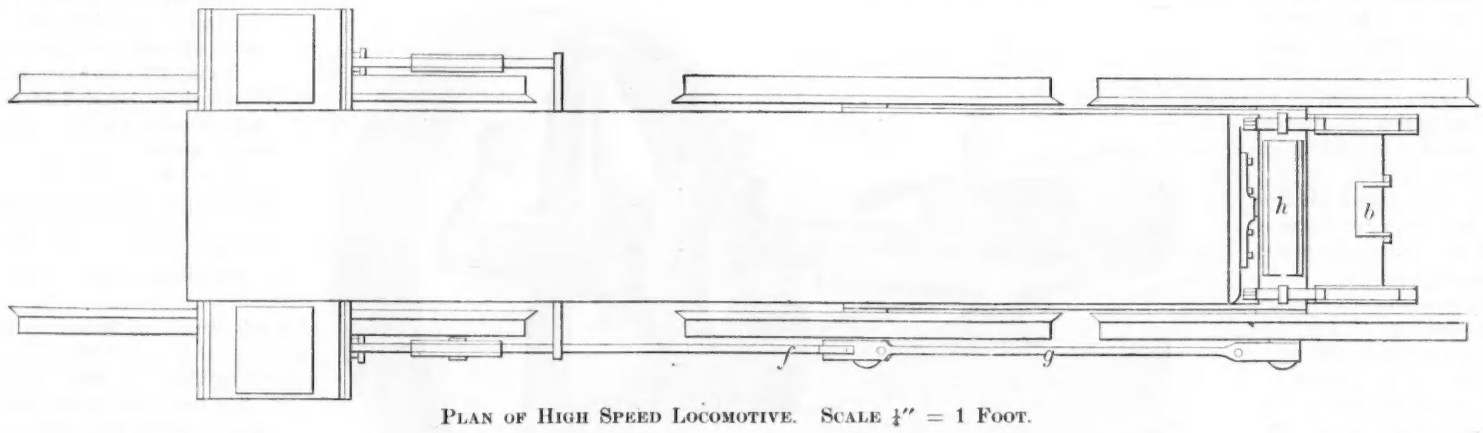
Were our standard guage considerably wider than it is, the "high-speed" problem would be less difficult of satisfactory solution.

The most efficient high-speed engine will be the one which has the lowest center of gravity, other things being equal. The next matter in importance is ample grate surface, and, thirdly, ample drivers, from seven to eight feet in diameter, in order to reduce the piston speed to reasonable limits. And, as our railways are largely made up of curves, a single pair of drivers is more compatible with great speed than two pairs. If two pairs are used, they should, of course, be placed as closely together as possible. Weight being an element of tractive efficiency, there can be no plea for lack of strength in any detail.

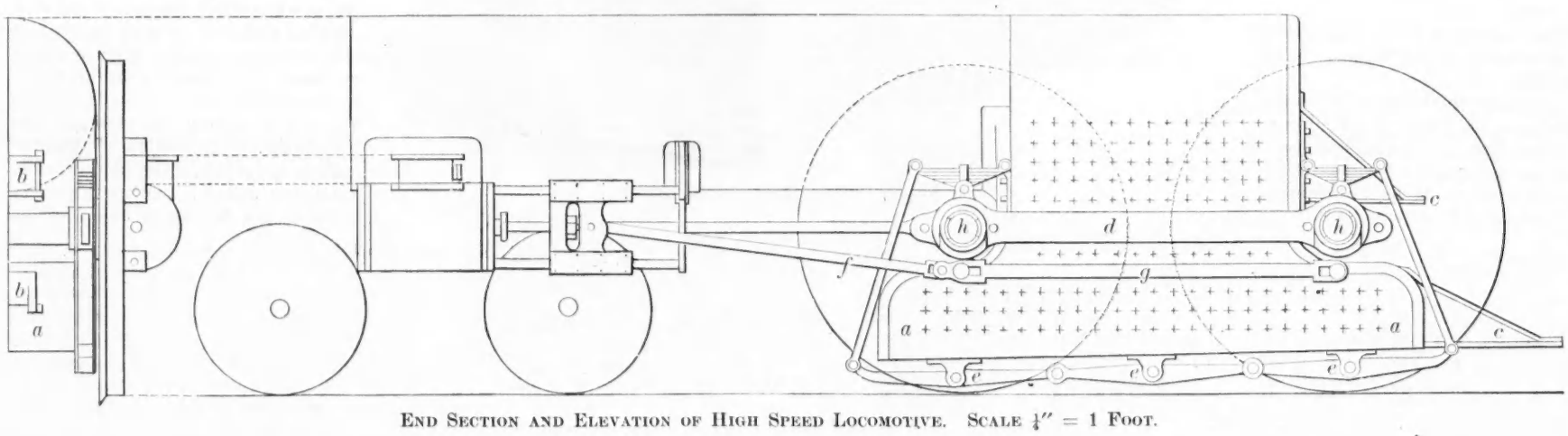
In the plan here delineated, it will be observed that the fire box *a* extends both backward and forward beneath the driving axles; the extension in this case being sufficient to give a grate surface of about fifty square feet, there being two fuel doors *b*, and two foot plates *c*. The side bars *d* are forged thin where they pass the fire box, so as to allow of the utmost width to the boiler. The equalizing levers *e* are attached to the base bar of the fire box, as shown. The necessary close proximity of the driving axles *h* to the boiler, renders outside eccentrics and valve gear (not shown) necessary. In order to avoid the usual long crank-pins, the main connections *f* are jointed to the ends of the parallel rods *g*, as shown. This style of connecting has the further advantage of reducing the large revolving main wrist bearing to one of vibration upon a small fixed pin, which is not liable to heat or much wear.

Further details enlarged will be given for a future issue. F. G. Woodward.

Worcester, Mass.



Plan of High Speed Locomotive. Scale ¼″ = 1 Foot.

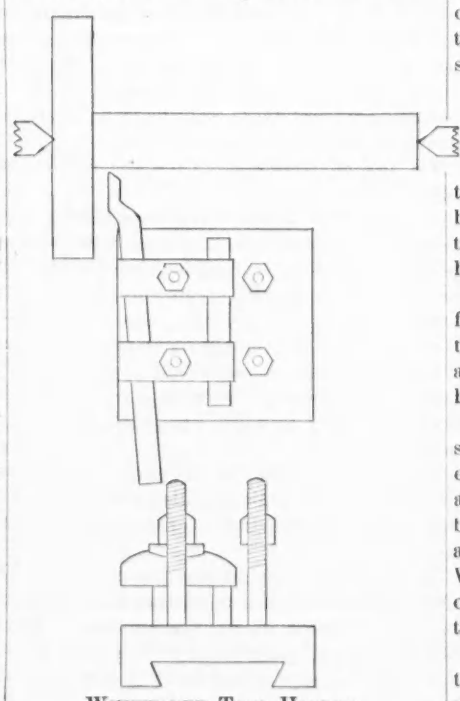


End Section and Elevation of High Speed Locomotive. Scale ¼″ = 1 Foot.

Iron-Planer Device and a Tool Holder.

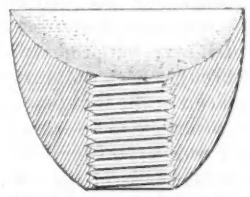
Editor American Machinist:

In answer to Mr. Rose on Cutting Tools, in March 19th issue, I wish to explain that I have found by experience the value of the tools on the Whitworth principle, especially where the tool has to be 6 inches or over, out of the rest. The advantage claimed for the iron-planer device shown by J. J. Newbaker, Feb. 26th, is in finishing inside and outside



Whitworth Tool Holder.

curves, or in fact any irregular shape which is needed occasionally, and requires to be finished smooth. One solid tool would use steel enough to make about 10 cutters to place on the back of the bar, so that a planer could keep well supplied with cutters for different sized fillets and roundings, without using so much tool steel, which is an item where a number of different shapes are required.



Device for Wrenches.

In filleting out corners of 1 inch radius and upwards, it is best to get the cutters forged in circular pieces about 1 inch thick. Drill a hole in the center, and turn up on a mandrel, giving about three degrees clearance on the cutting edge. This cutter can be moved around as it becomes dull, and saves going to the grindstone so often.

I used one of these a few weeks ago, 4 inches in diameter, on a Bessemer steel forging, having first roughed the work out something near the shape with an ordinary tool. It finished the job smoothly, cutting nearly one-fourth of the circle at once. A tool of this size would take a little work to forge solid and file up.

Speaking of lathe tools calls up an old grievance. Why do lathe manufacturers nearly always adhere to the one form of tool holder, which will only allow the tool a circular motion on the slide rest, and but little room for lifting it, so that tools on the Whitworth principle cannot be raised high enough?

The most convenient style of tool holder for all the different positions of the tool, that I have ever used, is the Whitworth, and that opinion is shared by all turners I have come in contact with.

It has 4 bolts and 2 clamps, as shown in sketch (some makers have each clamp long enough to go on two bolts at once), which allows the tool to be placed between the bolts or on either side of them, and also across the rest by changing one clamp. Where these rests are in use, the tools are oftener placed on the outside than between the bolts.

The bolts are made long enough to allow the tool to be raised as high as desired. The washers under the nuts are curved under the bottom, and the clamps are countersunk to suit them, so that the strain falls equally on the bolt, if the clamps should not be quite level. The clamps are also file-cut on the under side, to give a better grip on the tool.

Having to block up the tool with liners cannot be considered an objection, for too many of the present petty arrangements have to be helped out in this way. This is, without doubt, the firmest tool holder that is made, and gives room for a stronger tool to be used in boring a long hole. My fellow-workmen here wish there were more of them in use. George Roberts.

Steelton, Pa., March 28th, 1881.

Strengthening a Wrench.

Editor American Machinist:

As every bit of shop experience, which appears to be new, is of value to some of your numerous readers, I send you the following in regard to patching up a monkey-wrench handle (the wooden part of it I mean), which, as we all know, will sooner or later split off and turn an otherwise good tool into an unsightly looking, and almost useless piece of old metal. All that needs to be done to prevent splitting is to recess the nut which holds the handle on the body of the wrench, as shown by the sketch.

As I have not come across any wrenches with the nut made in this manner, I would suggest that those who manufacture such goods would do well to make them in future as above.

Brooklyn, N. Y. T. R. Almond.

Qualities of Some Glues and Cements.

In the course of a recent lecture upon glues and cements before the Polytechnic Club of the American Institute, Prof. John Phin said:

No cement can be fire-proof which contains organic matter, since this is decomposed at a temperature about that of melting lead or, say, 600° F. Cements containing oils will not be fire proof.

Silicate of soda mixed with asbestos is the nearest to a fire-proof cement. It will stand a low, red heat. It is decomposed at a bright red.

Water-proof glues are made in two ways. Glue and linseed oil are recommended, but I have had better success with the mixture. The chromates may be used with glue. These, when exposed to the light, render the compound insoluble.

Aquarium cement is the best water-proof cement I know. The formula is:

Litharge.....3	Rosin.....1
White sand.....3	Boiled linseed oil—
Plaster of Paris....3	

The solids are to be taken by measure in powder, and mixed. As it sets rapidly, the set must not be added until it is wanted for use. It is better for being put into a mortar, and pounded. It hardens in three days. It will hold glass firmly, and with it glass tanks may be made without frames, if the angles are well filled with cement. It is a kind of mastic, and could be used on brick.

What is technically known as marine glue stands almost by itself. Where it can be put on hot, it is admirable. It is composed of india rubber and shellac, dissolved in naphtha. Some kinds are hard, some almost liquid. I have seen this glue adhere to glass so firmly as to tear the glass when the plates were separated.

In the discussion which followed, Dr. Parmalee gave some interesting experiences in the manufacture of marine glue. He said its melting point was about 230 degrees, and in making, it was injured if the heat was carried above this point. In applying it, care should be taken not to go above this heat, as the melting point would be raised, and the strength diminished. In applying it the soldering iron may be used, but its heat must be regulated.

Foreign Technical Notes.

Translated for the AMERICAN MACHINIST.

HOW GERMAN MANUFACTURERS CAN BEAT OUR TARIFF ON BESSEMER STEEL.

The *Polytechnische Zeitung* delivers itself at some length with reference to a subject of considerable importance to American Bessemer steel manufacturers. It is there stated, that the last German consular report from Boston gives some interesting particulars in regard to the imports of German steel wire into the United States, from which it appears that, according to the interpretation of the tariff of steel on the part of the Minister of Finance, round steel wire of not less that ¼ inch diameter, even if coiled, is not to be treated as steel in coils, but as "steel not specially named of another shape." Consequently, Bessemer steel, Nos. 4 and 5, for the manufacture of steel wire, can be imported at a duty of 30 per cent. *ad valorem*, or about $15 per ton, whilst Bessemer bars, 1½ inch to 2 inch square, have to pay a duty of 2¼ cents per pound. As the transformation of 1⅛ inch bars into No. 4 rods for wire involves an outlay of £3 to £4 per ton, it follows that the American steel works that sold their bars for $57.50 to $65 per ton, and during the late rise, even for $90 to $95, cannot compete with European steel wire, which can be sold here at $60 to $65. By far the greatest quantities of these steel rods have been sent from Germany, which is the more interesting as the inquiry for this steel wire is beginning to develop very extensively. There are in Germany thirty-eight wire works, which supply on an average 500 tons per month, or about 228,000 tons annually. It is well known that certain descriptions of German iron are particularly suited to the manufacture of wire, and, owing to this, German wire is generally held in good repute. At present, and last year, the wire mills multiplied to such an extent that the production of wire in 1880 seemed far to exceed the demand. Another matter to note is that rather heavy lots of steel wire for telegraph purposes are being imported in America, and especially in New York, from Germany; also the import of German "steel blooms" has again begun, and the latter have been ordered in heavy quantities in Germany. It is to be presumed that the import this year will be very considerable, if the present tariff, 45 per cent. *ad valorem*, is not changed. It is not improbable that with the new management which has just taken the helm, great efforts will be made to upset the decision of the last Minister of Finance in regard to Bessemer rods and steel blooms.

A BELGIAN AXLE LATHE.

The *Moniteur Industrielle* says that the axle lathe lately constructed by Messrs, Fetu & Co., of Liége, Belgium, is giving great satisfaction. A special feature in this lathe is the arrangement with which it is fitted for turning the central tapered portions of axles. For this purpose each of the two slide rests, with which the lathe is provided, is fitted with a cross slide, having at the back an arm fitted with a block sliding in a recess in an inclined bar mounted in the rear of the lathe bed. There are two of these bars—one for each slide rest—and they are so mounted that the angle which they form with the center line of the lathe can be varied at will. These bars are set to the angle required for the tapered part of the axle, and it is evident that as the slide rests travel along the bed, the cross slides will be actuated by the inclined bars, and the tool made to cut the axle to the required taper. When turning the parallel portions of the axle, the connection between the inclined bars and the cross slide is, of course, thrown out of gear, and the cross slides clamped down to the slide rests.

THE LATE FRENCH AGRICULTURAL SHOW.

The Agricultural Show, says the *Revue Industrielle*, which was held at Paris in connection with the annual show of cattle and general agricultural produce, from Feb. 21 to Feb. 28, was a great success. It was held at the Palais de l'Industrie in the Champs Elysees. Amongst the most noteworthy machines exhibited in connection with this country, may be mentioned the firm of Waite, Burnell & Co. of Paris, who were largely represented, and nearly all their machines exhibited were of American make. Particular mention must be made of a new system of wind-mill pump, also an American invention, exhibited by Ritter & Gigaroff, Paris. This pump, which has only just been patented in France, is said to defy even the most violent tempest; it will raise 1000 gallons of water per hour from a depth of fifty feet.

COMPOUND LOCOMOTIVES IN FRANCE.

In the last number of *Chemin de fer* to hand, M. Mallet gives a detailed description of the results obtained with the compound locomotives, constructed according to his system, and now in use on the Bayonne-Biarritz railroad in France. Considering their simplicity of construction, they deserve a passing notice from us. The results obtained were highly satisfactory, and show a marked improvement as compared with the existing system. These locomotives were manufactured by the well-known firm of Schneider & Co., Creuzot. They are tank engines, with three axles; the leading or front axle is coupled with the driving axle with outer cylinders, lying horizontal. The first three of these engines turned out weighed each, completely fitted out, 19,600 kilogr.; a fourth weighed 24,500 kilogr.; the last was principally used on Sundays, and otherwise, when the trains consisted of more than four carriages. The weight of the carriages, when empty, was on the average of nine tons, and they are capable of seating between 70 to 100 persons each. The above railway is only five miles in length, and has gradients up to 15 in 1,000 (1:67); 38 per cent. of the entire distance consists of slopes over 1:200. The smallest radius of curve is 985 feet; on the whole 42 per cent. of the line lays in curves. The medium speed of the trains is 21 miles per hour. Last year there were altogether 14,910 trains, carrying 556,229 passengers. The number of miles which the trains traversed was 74,252, so that each of the four locomotives, on an average, performed 18,563 miles. The fuel consumed by these four engines was 926,000 lbs. of Cardiff coal, giving therefore 12½ lbs. per mile traversed, which also includes the coal used in lighting the fires, and when the engines were stationary. The fuel consumed is therefore wonderfully small, especially when we consider that the many curves and gradients made the working very difficult. During 16 hours in the day two locomotives were always lit up, which ran, on an average, 40 trains in 10 hours.

Other good results with the compound locomotives have been obtained with those constructed on the patented system of Borries. They showed a saving of 16.5 per cent. of fuel against other locomotives performing the same work. The principal proportions of these engines are the following:

Total weight (in working order)	18,000 kg.
Adhesive weight	9,600 "
Heating surface of boiler	229 in.
Steam pressure	12 atm.
Diameter of cylinder	200mm.
Stroke	400mm.
Diameter of wheel	1,130mm.

For the sake of simplicity, and as this was not deemed necessary by the proportion of the cross cuts of the cylinders of 1:2.25, the reversing shaft is not divided; therefore both cylinders receive at the same time equal filling up. The whole valve motion is as simple as in other locomotives, and the regulator valve is also only plainly constructed, *i. e.*, without small discharging slide, and completed in such a manner that when the regulator is entirely open, steam passes into the receiver through a small opening of 15 mm. in diameter. Both inventors are confident that the compound system will be the system for the future, not merely for ships and stationary engines, but also for locomotives.

NEW PROCESS FOR THE DEPHOSPHORIZATION OF IRON.

When, in April and May last year, says the *Revue Industrielle*, it was demonstrated that the problem of dephosphorizing iron in the Bessemer converter had, by the Gilchrist Thomas system, been definitely solved, other scientists since then determined to test other processes. It is, therefore, not surprising to hear that a new system of dephosphorization is at the present moment spoken of in metallurgical circles. The process in question is of German origin, being the invention of Mr. Osann, a civil engineer of Dusseldorf. The process has been tried and experimented on at the well-known works of Mr. Fried. Krupp, at Essen, and the results obtained are said to be highly satisfactory. This process is said to have the following advantages over that of Gilchrist-Thomas: (1) A production equal in quantity to the output of an ordinary Bessemer furnace; (2) no inconvenience occasioned from blowing over; (3) capability of using any kind of pig, which can thus be run directly from the blast furnace. The steel produced at a charge gave a tensile strength of 54.3 kilog. per square millimeter of section, with an extrusion of 20 per cent., and contraction of area at point of breakage of 44 per cent. A point of some importance in connection with this process is the blocking up of the converter with slag, and in cases where proper provision against this has not been, or cannot be made, it proves the source of much delay. No difficulty has been found in eliminating the phosphorus, even when in the blocking up large patches of firebrick were used.

Newly Incorporated Companies.

ILLINOIS.

The New York and Chicago Railway Company, Chicago; C. R. Cumming, W. B. Howard, Geo. A. Ives and James E. Neal, incorporators; Capital $2,000,000. To construct a railway from Chicago to a point on the line dividing the States of Illinois and Indiana, near the Northwestern corner of said line.

The Danville and St. Louis Railroad Company; Chicago; Francis G. Tibbets, Edgar Homes and others, incorporators; Capital $1,000,000. To construct a railroad from Danville to a point on the St. Louis, Alton and Terrehaute railroad in Cales County; also a line of road from Vermillion County to Shelby County.

The Indiana, Bloomington and Western Railway Company has consolidated with the Ohio, Indiana and Pacific Railway Company, forming one company, under the name of The Indiana, Bloomington and Western Railway Company; Capital $10,000,000. Principal office, Indianapolis.

The South East and St. Louis Railway Company has leased to the Louisville and Nashville Railroad Company all its original and consolidated lines of railway, embracing a length of 235 miles of road, for a term of 49 years.

The Kankakee and Seneca Railroad Company. Kankakee; Thomas B. Bonfield, Wesley Bonfield and others, incorporators; Capital $10,000. To construct and operate a railroad from Kankakee to Seneca.

The Belleville and Carondelet Railroad Company, Belleville; Wm. E. Burr, Jos. Z. Chapman and others, incorporators; Capital $500,000. To construct a railroad from the Mississippi river opposite St. Louis or Carondelet to Belleville.

The Quincy, Jerseyville and St. Louis Railway Company, Chicago; Robert H. Law, Wm. B. Judson, Chas. C. Busby and others, incorporators, Capital $1,500,000. To construct a line of railway from a point at or near Rockport, Pike County, to the Northern boundary line of Macoupin County.

The Harrington & Oglesby Company, Chicago; Charles B. Oglesby, Stephen Harrington, and others, incorporators; Capital, $15,000. To manufacture and sell perforated sheet metal.

The Plano Manufacturing Company, Plano; Lewis Steward, F. H. Lord, and others, incorporators; Capital $100,000. For manufacturing purposes.

The Illinois Plow Works, Springfield; F. W. Tracy, A. L. Ide, and others, incorporators; Capital, $50,000. To manufacture plows and agricultural implements.

The Dimond Cross Mill Company, Chicago; W. K. Everson, F. H. Waterbury, and others, incorporators; Capital, $600,000. To manufacture, mill, etc.

INDIANA.

Indianapolis Car & Manufacturing Co., Indianapolis. Principal Incorporators, Chas. S. Millard, Wm. R. McKeon and William B. Howard. For manufacturing railroad cars and parts thereof and other railroad supplies of wood, iron, brass and other metals and the sale of the same. Capital stock, $100,000.

Electric Light, Gas Heating & Illuminating Company, Lafayette. Principal Incorporators, John R. Cofforth, John B. Ruger and Thomas Hanlon. Capital stock, $50,000.

PENNSYLVANIA.

The George W. Snyder Company, Pottsville, George W. Snyder, Baird Snyder, and others, incorporators. Capital, $50,000. For manufacturing iron, steel and other metals

New Brighton and New Castle Railroad Company. Principal office, Pittsburgh. J. N. McCullough, William Shaw, and others, incorporators. Capital, $210,000. For the construction of a railroad, 21 miles in length from the borough of New Brighton, in Beaver county, to the city of New Castle, in Lawrence county.

The American Facing Company, Philadelphia. John A. Emerick, Wm. H. Dickson, and others, incorporators. Capital, $20,000. For manufacturing and dealing in foundry facings and foundry supplies.

The William Cramp's Sons Dry Dock Company, Philadelphia. Charles H. Cramp, William M. Cramp, and others, incorporators. Capital, $50,000. For building, buying or leasing dry docks, and using the same in taking out ships and vessels for repairs; and to carry on the business of building and repairing ships in all its branches.

NEW JERSEY.

The Hathaway Combination Lock Company, Jersey City; John L. Hubbard, David P. Dey, Geo. M. Hathaway, Warren S. Dey and Jefferson T. Rapellee, incorporators; Capital stock, $500,000. To manufacture and sell the Hathaway Combination Locks.

The Lebanon Magnetic Iron Company, Camden, N. J. and Philadelphia, Pa.; Capital $150,000; Lewis Barnes, Edward P. Carpenter and Ev. Machette, incorporators. To carry on the business of iron mining and manufacturing in New Jersey, and of selling and dealing in iron.

The Dundee Chemical Works, Passaic City, James Butterworth, John W. Butterworth and John T. Sherman, incorporators; Capital stock $60,000. To manufacture and sell chemicals.

The Barbour Twine Company, Paterson and New York; Thomas Barbour, Henry V. Butler, David D. Spence and others, incorporators; Capital stock $500,000. To manufacture, buy, sell and deal in harvesting or sheaf-binding twine, carpet yarns, sail and bagging twines, cordage and threads of flax, hemp or other fibrous materials; to buy, sell, import and deal in every description of hemp, flax, or the tows thereof, etc., etc.

NEW YORK.

The United States Gas Improving and Sewering Company, New York; F. Yung, A. A. Stenbraud and others, incorporators. Capital, $1,000,000. To manufacture and sell Gas Checks and Regulators, Gas Carburetters and Economizers, under patents issued to Peter Keller.

The Martin Manufacturing Company, New York; Theo. B. Comstock, Arba Martin and others, incorporators. Capital, $50,000. To manufacture and sell the Martin Saw Filer and such other tools, implements and materials as to said Company may seem advisable.

The New York Dynamo Electric Manufacturing Company; Robert C. McClure, A. C. Butler and others, incorporators. Capital, $25,000. To manufacture and sell Electrical Apparatus and machinery, and for the acquisition of patents obtained by John Butler and others.

Central Tunnel Railway Company, New York City; John Cochran, Wm. Kent and others incorporators. Capital, $5,000,000. To construct, maintain and operate a railroad commencing at or near City Hall Park, in City of New York, and terminating at or near Grand Central Depot, 42d St. in said City. Length of road about 5 miles.

J. Brinkley & Co., New York, John B. Sammis, Benj. F. Britton and others incorporators. Capital $2,500. To manufacture, buy and sell carriages, wagons and other wheeled vehicles.

The Independent Watch Company, of Fredonia. Theo. S. Hubbard, Edward D. Howard and others, incorporators. Capital, $150,000. To manufacture and sell watches, watch cases, watch material and all materials pertaining to the same.

Rochester, Lakeside and Braddocks Bay Railroad; Herman Glass, Alexander Pomeroy and others, incorporators; Capital $100,000. To construct, maintain and operate a railroad, beginning at some central point in the city of Rochester, and running along streets of said city to northeast corner of Rochester Driving Park, thence northerly to boundary line of city, thence to Holy Sepulchre Cemetery, thence to village of Charlotte near south shore of Lake Ontario, thence west along south shore of said Lake, to the hotels and summer resorts on said Lake, Long Pond and Braddocks Bay.

National Oil Company (limited), New York, Joseph L. Robertson, Edgar I. Warner and others, incorporators; Capital $50,000, To manufacture and sell lubricating and other oils, greases and lubricants of all kinds, and railway and machinists' supplies.

The Universal Beer Keg Company, New York; Jno. L. Culver, Joseph L. Spofford, and others, incorporators; Capital, $120,000. To manufacture and sell kegs and barrels for beer and other liquids, and the attachments and appurtenances of such kegs and barrels, and to sell rights to manufacture same on royalty.

Hudson Tunnel Railway Company, New York; Wm. M. Force, Chas. G. Lincoln, and others, directors; Capital, $10,000,000. New Company formed by consolidation of the Hudson Tunnel Railway Company, of the State of New York, and the Hudson Tunnel Railroad Company, of the State of New Jersey.

The Vita-Electrine Company, New York; Sidney S. Norton, Lester C. Hubbard, and others, incorporators; Capital, $50,000. To manufacture and deal in vita-electrine and other proprietory medicines, medical appliances or combinations, and the machinery and apparatus for the same, and to purchase patents necessary for said business.

MASSACHUSETTS.

Springfield Steam Power Co., Springfield; George C. Fisk, Pres't., Henry S. Hyde, Treas. Capital $200,000. For furnishing steam power and heat.

The West India Importing and Manufacturing Co., Boston; Chas. A. Jackson, Pres't., Andrew J. Wheeler, Treas. Capital $300,000. For the manufacture and sale of West India and other products, also, the exportation and the importation of products to and from the West Indies and other points.

The Executive Committee of the Cotton Exposition to be held in Atlanta, in October, November, and December, received notice March 30th of a subscription of $25,000 from leading merchants in New York city. Nearly $100,000 has been raised so far for the Exposition.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

Horace B. Miller, Prest.

Jackson Bailey, Vice-Prest.

Lycurgus B. Moore, Treas. and Sec'y.

96 Fulton Street, New York.

Jackson Bailey, Editor. Horace B. Miller, Business Manager.

Lewis F. Lyne, Mechanical Engineer.

The American News Company,
Publishers' Agents, New York.

The International News Company,
(Formerly the Wilmer & Rogers News Co.)
11 Bouverie Street, (Fleet St.) London, Eng.
Will receive subscriptions for the American Machinist at 17 shillings per annum, postage prepaid.

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The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

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NEW YORK, APRIL 16, 1881.

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The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

Manufacturers' and Workmen's Trade Unions.

The Excelsior Manufacturing Company, of St. Louis, says a press dispatch, one of the most extensive stove-making concerns in the West, announce that hereafter no man of the Moulders' Union will ever be allowed to work in their shops under any circumstances.

This purports to be a high and mighty movement, against a wicked organization. A little explanation, however, is in order. The stove manufacturers—or at least a considerable number of them—throughout the United States, have for some years past been united in a trade union called the National Stove Manufacturers' Association, of which the manager of the company mentioned in the press dispatch referred to, is now vice-president. One of the objects of this trade union or combination is to regulate and control the prices the public are required to pay for stoves. At their last annual meeting, held but a few weeks ago, they determined to demand a material advance in the price of stoves, which fact was duly and properly telegraphed to leading newspapers in all parts of the country, and published, thereby letting stove buyers have peremptory notice of what they were expected to do. The combination explained, as a reason for this step, that prices of materials and labor had both advanced, and further advances ought prudently to be anticipated, therefore they were justly entitled to an advance in the market price of their product. So far as we know, nobody has tried to raise any public outcry against their arbitrary demands. Neither the daily nor the industrial press has denounced the movement, or endeavored to incite opposition to it in any form. Among others, we had quietly made up our mind to pay an increased price for our new stove after the May-day moving, if it should be demanded, without a murmur.

The members of the manufacturers' union went home after their deliberations, dinners and speech makings were over, apparently satisfied with themselves and with the situation. But there is another combination among those who depend upon the stove-making business. It is an association of workmen known as the Moulders' Union. They had read the news about the higher prices, and the tendency of things to advance. We must here digress just to make an observation—that there frequently seems to be an innate tendency among workers for wages to copy the methods and aims of their employers. It may not be very surprising, but if we must accept the dispensations of several of our worthy industrial exchanges, it must sometimes be very soundly condemned. However, the Moulders' Union rashly held a meeting—or rather several meetings—and following the plan of their employers' council, decided to demand an advance of wages. They explained their action on the ground that rents and the cost of the necessaries of life (including stoves) had risen, and might be expected to go higher yet, while the manufacturers, their employers, were raising the prices of their products. Upon these considerations they claimed to be justly entitled to a small advance—about 10 per cent.—in wages. This sudden and pronounced demand almost made some of the stove-makers' union hold their breath, at the audacity of the thing. But as soon as they recovered sufficiently to comprehend, in all its variegated hues, the changeable situation, they resolved to fight with all the ammunition at their disposal rather than yield one picayune to the "agrarianism of the workmen employed in such business and their unions." (We borrow this phrase from one of the aforesaid industrial exchanges). The next news given to the public is that several of the manufacturers have fallen in with the higher wages as complacently as the public with the higher prices of stoves. Others again have endeavored to gradually fill up their works with apprentices and non-unionists until they can bid defiance to the moulders' association. Strikes are thereby precipitated, and to cap the climax we are greeted with the announcement that one of the leading concerns in the manufacturers' union has issued a manifesto that never—not even "hardly ever"—shall one of the Moulders' Union be allowed to work in their shops. In view of the fact that every union moulder has refused to work in the shops of that concern, nothing short of one of the inimitable colored cartoons of *Puck* can adequately represent the ludicrousness of the situation.

Viewed from an unbiassed standpoint, the concern in question has been caught in its own net—or, at least, in a net of the same pattern. Stove manufacturers have capital and enterprise invested in business, and they have stoves to sell. The moulder's investment is his skill and industrial force, and he has labor to sell. Each of the former has an unquestionable right to ask individually what he pleases for his product, and so has the latter. But if the manufacturers have a right to combine to force the public to pay higher prices for their stoves, the moulders have just as much right to combine to force the manufacturers to pay them higher prices for their labor. If one party is right in so doing the other is right, and and if one is wrong, on the same grounds the other is wrong. If the manufacturers, who are bound by their combinations to exact certain prices from their customers, will abandon such concerted movements and each act independently, they may ask for and receive sympathy from the public when subjected to arbitrary and unreasonable demands on the part of their workmen, who are acting according to the decision of their trades unions.

Some Improvements in our Columns.

Our reading columns have been for a long time past so overcrowded with matter which we are loth either to curtail or to leave out, that we shall hereafter set our departments of "Manufactures" and "Newly Incorporated Companies" in nonpareil type, in order to economize space. The information contained in these departments, while valuable to the superintendents, foremen and workmen who desire to obtain situations, is commercial intelligence, especially valuable to manufacturers and dealers in machinery and supplies. Presented in short paragraphs, which, even in fine print do not tire the eye (no studying being required), there can be no objection to our placing this information in the type familiar to all our readers as that in which our "Questions and Answers" are printed, especially in view of the quantity and quality of the additional matter which we are thus enabled to present. In publishing weekly reports of the incorporation of new railroad and manufacturing companies, we aim to give the names of a sufficient number of the incorporators to enable any one who chooses to communicate with the companies with which they are connected. To obtain the precise address of individual incorporators in large cities, the directory will have to be consulted. The American Machinist is the only periodical published in this country which presents, to any extent, reports of such newly-incorporated companies. These reports may in all cases be relied upon.

Varying Examples of Shop Practice.

In this issue Chordal comes to the front again on the drawing question. It will be noticed that he takes issue with some of our correspondents who have touched this subject in our department, "Letters from Practical Men." This leads us to remark that the object of this department is not to embody ideally perfect shop practice, but rather to show up actual and representative shop practice in a way that will call out discussion and suggest improvement. Unless the case is stated on both sides, discussion is stifled, and the hand of improvement has nothing to lay hold of. As the readers of the American Machinist include a large, if not the largest, portion of the mechanical engineers of this country, such examples of inferior shop practice as are admitted to these columns, to show how work is done in certain shops and localities, are pretty sure to be overhauled and corrected. Any one of these letters that entirely escapes criticism is pretty sure to represent sound practice, therefore, no regular reader of the American Machinist need be misled in any case. No one mechanic, however capable, can be expected to "know it all," and in the multitude of counselors there is wisdom.

A Connecticut firm manufacturing steam boilers, in loading a boiler on a flat car for shipment to a distant customer, always make it a point to load the car before they mark the boiler. Then they mark the address of the customer on the side of the boiler in good shape, together with their own name and address as manufacturers in big letters, forming a traveling advertisement pleasing to the customer and useful to themselves. This firm believe, that the boiler manufacturer who marks his boilers before loading them, and then gets them on the car with the address upside down, so nobody can read it in transit, is not fully awake to the business needs of the hour.

Latest Testimony in the Seawanhaka Case.

According to the latest testimony in the *Seawanhaka* case, pretty much everybody seems to have been to blame. One witness testified that of about thirty life preservers which he took down, half had lost all or a portion of their straps. Others had been painted so thickly that the strings were imbedded fast in the paint. One of the life-boats showed daylight through seams that were open from one-quarter to one-eighth of an inch wide. Another passenger testified that he tried with others to launch one of the only two life-boats, and found that the canvas weather-cover was as stiff as sheet-iron from frequent painting, while the boat was so securely tied down that the fastenings could not be loosened, none of the excited passengers happening to have a butcher's cleaver about his clothes.

The well-known mechanical engineer, and steam-boiler expert, Francis B. Allen, testified that he visited the wreck on July 21, 1880, in company with the grand jury. He had a hammer, a chisel, and a light with him, and examined the boiler inside and out, and chipped off specimens from the decomposed and fractured parts. He found cracks extending partly around both the inboard and outboard flues on the starboard boiler, in which the rupture of the tube occurred. He showed these fractures to the jurors at the time by candle light. These fractures he regarded as very important, because they explained the cause of the disaster. One of the flues was open a quarter of an inch, and the other one-eighth of an inch at the fracture. He attributed the fracture to the excessive jar in the boiler and the explosion that was heard in the vessel.

The escape of steam and water made a back-draft that drove the flames out of the furnace and ignited objects near it. He chipped off a part of the iron at the fracture in the flues, and it appeared quite brittle from deterioration. He next examined some of the tubes and found them very thin at the edge, indicating that they were thinned down to a dangerous extent. He found 11 loose rivet heads in the two flues, the heads being worn or corroded away. He believed the starboard boiler had been in a dangerous condition for fully six months, a state of things which a thorough inspection by competent engineers, should have discovered when the boat was officially inspected on the 16th of March.

Good machinists, foremen, draughtsmen, designers, boiler makers, tool makers and other mechanics, can find opportunities for good situations by looking through our columns this week. There has probably never been a time in the history of the country when mechanical skill and industry commanded such substantial recognition as now.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) E. L., London, Ont., asks: Would you please inform us as to the number of surface inches of heating coils required per cubic foot of space contained in a room, the temperature being about 60°? *A.*—It is customary to allow one square foot of heating surface to 70 cubic feet of air contained in the room. But in cold climates or in exposed positions the cubical contents of air is reduced to 60 for each square foot of heating surface.

(2) C. M. D., Winooski, Vt., asks: How can I find the weight of cast iron, wrought iron, and other metals when only the dimensions are given? *A.*—First, find from the given or measured dimensions of any piece and kind of metal, the solid contents or number of cubic inches, or of cubic feet, of the metal contained in the piece, by multiplying together its average length, breadth, and depth in inches or feet, or by multiplying its average of end and cross section areas in square inches, or square feet, by its length in inches or feet. Then multiply the total number of cubic inches, or cubic feet, thus found to be contained in the piece, by the weight of one cubic inch, or one cubic foot, of that kind of metal, which you can take from Tables of Weights of Metals in engineers' and mechanics' pocket books, which give the different weights of one cubic inch, or of one cubic foot, of the various kinds of metals and substances. The following table is for the weights of both—one cubic inch and one cubic foot of the principal metals, and is in compact form for use.

NOTE.—The table has been consolidated and arranged from Rankine's and Nystrom's tables—giving the weights for both a cubic inch and a cubic foot of the metals.

KIND OF METAL.	Weight of One Cubic Inch in Pounds.	Weight of One Cubic Foot in Pounds.
Brass, cast	0.298	515.
do rolled	0.308	533.
Bronze, gun metal	0.303	524.
Copper, cast	0.311	537.
do rolled	0.318	549.
Gold, hammered	0.700	1210.
Iron, cast, average	0.257	444.
do wrought, do	0.278	480.
Lead	0.412	712.
Platinum, rolled	0.798	1350.
Silver, cast	0.379	655.
Steel, cast, average	0.283	489.
do wrought	0.286	494.
Tin, average	0.267	461.
Zinc, cast, average	0.252	435.
do rolled	0.260	449.

(3.) J. P. M., Baltimore, Md., writes: I wish to ask a few questions about steam boilers. 1. Take two plain return tubular boilers, one of them 50 inches diameter, 14 ft. long, shell ⅜″ thick, heads ½″, and the other 36″ diameter 10 feet long, shell ¼″ thick, heads 5-16″ thick, each to carry 90 lbs. steam; which has the greatest strain on the iron, and which will carry the highest steam pressure safely, and how much? *A.*—To find the tensile strain on the iron of a cylindrical boiler shell, multiply the longitudinal section area of the shell in square inches by the No. of lbs. steam pressure per sq. in. for the total strain, and divide this product by the longitudinal section-area in square inches of the metal of the shell; this quotient is the tensile strain per square inch on the iron. Thus, for the 50″ boiler; its section-area is (50×14×12) =8,400 square inches, which multiplied by the No. of lbs. steam pressure per sq. in. (90 lbs.) is, (8400×90)= 756,000 lbs. total steam. The cross-section area of the metal in the shell is (14×12×2× ⅜) = 126 square inches. Dividing the total strain by the total number of square inches of iron it strains upon, gives (756,000 ÷ 126)= 6,000 lbs. tensile strain per square inch of the iron in the shell. In this way the strain on the 36″ boiler is found to be

$$\left(\frac{36\times10\times12\times90}{10\times12\times2\times0.25}=\frac{388{,}800}{60.}\right)=6{,}480 \text{ lbs.}$$

6,480 lbs. per square inch of iron in the shell. A rule for calculating the bursting pressure in pounds per square inch of a single riveted cylindrical boiler is to multiply the tensile strength of the boiler iron in pounds per square inch by its thickness in inches, and divide this product by the radius, or half diameter, of the shell in inches. This gives the actual bursting pressure. The safe working pressure is 1-6 of the bursting pressure, and if the boiler is double-riveted, add 20 per cent. to this safe pressure. Thus, for the 50″ boiler, single riveted, and made of ordinary good iron, which stands a tensile strain of 50,000 lbs. per square inch, the bursting pressure is

$$\left(\frac{50{,}000 \text{ lbs.}\times\frac{3}{8}}{50\div2}\right)=750 \text{ lbs.}$$

750 lbs per square inch, and the safe working pressure is 1-6th of this, or

$$\left(\frac{750 \text{ lbs.}}{6}\right)=125 \text{ lbs.}$$

125 lbs. per square inch. If the boiler is double-riveted, adding 20 per cent., or 1-5th, gives

$$\left(750+\frac{750}{5}\right)=900 \text{ lbs.}$$

900 lbs. bursting pressure, and

$$\left(\frac{900}{6}\right)=150 \text{ lbs.}$$

150 lbs. safe pressure. In the same way the small boiler is found to have, single riveted,

$$\left(\frac{50{,}000 \text{ lbs.}\times0.25}{36\div2}\right)=694 \text{ lbs.}$$

694 lbs. bursting pressure, and

$$\left(\frac{694}{6}\right)=116 \text{ lbs.}$$

116 lbs. safe pressure. Double riveted, it has (694.×1.20)= 833 lbs. bursting pressure, and

$$\left(\frac{833.}{6.}\right)=139 \text{ lbs.}$$

139 lbs. safe pressure. From which it appears that the large boiler will carry eight per cent. more steam than the small one. (2) What rule would you give for the proportion of heating surfaces of the boiler and flues, and what amount of heating surface is required for a 50 H.P. boiler? *A.*—Common practice in two-flue boilers is to make the diameter of the flues about one-third the diameter of the boiler, which, as the boiler has only about ⅔ the circumference of the shell for its heating surface, makes the heating surfaces of the two flues about the same as that of the shell. To carry higher pressures than would be allowed with two flues, more flues of less diameter, up to 5. and 6. in number, are sometimes used. Common practice also gives 12 square feet of heating surface per horse power, or (50×12)= 600 square feet for 50 H. P. (3.) What is the rule for locomotive type of boilers, with fire-box and tubes? *A.*—The heating surface is wholly in the tubes and fire box, the external tube surface being from 7 to 12 times the fire-box surface, and the whole heating surface being about 15 square feet per H.P.

(4) F. D. L., Rochester, N. Y., writes: I am putting in a grindstone 61″×6″, for dry-grinding cast-iron articles cast on a chill. What speed should such a sized stone be run to do the most work and not be liable to burst? *A.* The higher the speed of the periphery of the stone, the more work can be done on it, but the speed for safety should govern its motion. The stone weighs about 1,350 lbs., its diameter section is 342 sq. inches, allowing it to have tenacity of resistance to rupture, or tearing a part of 600 pounds to the square inch throughout its section, its whole bursting resistance would be (342×600 lbs.)= 205,200 pounds, and a safe strain would be ⅙ that, or 34,200 lbs. Suppose it is revolved at 200 revolutions a minute, its centrifugal or bursting force, due to its weight and rotary motion, will be, closely, 32,000 lbs., which is (34,200−32,000) = 1,200 lbs. less than what the stone will safely stand. In some instances, grindstones of 6 ft. diameter are run at 200 revolutions a minute, but they are of best quality, well balanced and supported, and carefully run. In your case we recommend 150 revolutions per minute.

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James W. See, Designing and Consulting Engineer, Hamilton, Ohio.

J. C. Hoadley, Engineer and Expert, formerly of Lawrence, Mass., has opened an office at 29 High St., cor. Federal, Boston, Mass., where he will be pleased to receive old and new friends.

"Extracts from Chordal's Letters" in book form, now ready. Cloth. 330 pages. $1.50 by mail, postpaid. American Machinist Publishing Co., 96 Fulton Street, New York.

MANUFACTURES.

Schenectady (N. Y.) Locomotive Works have 800 workmen and are running over time every day.

Bench and machine moulders of Cincinnati have had their wages advanced 10 per cent.

Boiler makers of Chicago have been on a strike for higher wages for some time past.

The stove moulders of Bridgeport, O., have had their wages advanced 10 per cent.

The Buckeye Stove Company is a new corporation at California, Hamilton County, O.; Capital $20,000.

A. R. Homesly, Shelby, N. C., is about to erect a large cotton factory near the Catawba river.

The Taunton (Mass.) Locomotive Works have ordered about $20,000 worth of new machinery.

St. Louis is to have an edge tool works in 90 days to employ 40 men. So says the *Age of Steel*.

Eighty-five locomotives and 3,751 cars were built at the Penn. R. R. Shops at Altoona last year.

A car shop is to be built in Muskegon, Mich., to employ 100 men.

The Joel Hayden Brass Company will employ three hundred workmen at Lorain, O., in April.

Gordon W. Hall is about to start a machine shop in Lockport, N. Y., to build steam canal boat machinery.

Hatfield (Mass.) Pistol Works will be ready to start about June 1. The shop is 100x31 ft. three stories high.

Albert Pelton, Orange, Mass., will fit up a saw and grist mill; also put in some new wood-working machinery.

Lewis Fairbrother will soon erect a shop at Pawtucket, R. I., 100x40 ft., three stories high; to let for manufacturing purposes.

The Stormont Cotton Company are to erect a large cotton mill at Cornwall, Canada. It will contain over 700 looms and will cost $400,000.

Conant Thread Company, Pawtucket, R. I., are expected to build another mill 450 ft. long and four stories high.

Riverside Manufacturing Company is a new concern that will erect a mill at Stafford Hollow, Conn., to manufacture cassimeres.

The Parvin Manufacturing Company, Forest Grove, N. J., have leased a foundry building in Vineland, and will remove to that locality at once.

Charleston, S. C., expects to have a $400,000 cotton mill as soon as it can be erected, all the capital having been subscribed.

William Munzer, 509 and 515 First Ave., New York, has begun to build the new Baxter Automatic Cut-off Engine, both portable and stationary.

The Belcher Sugar Refining Co., St. Louis, will build a twelve story sugar refinery using 6,000,000 brick.

Klein, Logan & Co., tool manufacturers, Pittsburgh, Pa., are building an addition to their shops 50 x 110 ft. thus more than doubling their capacity.

The Georgia Railroad Company have purchased the old site of Markman's rolling mill in Atlanta, upon which to build car shops for the company.

The Pittsburgh Car Works Co. have contracted to move to Youngstown, O., and will be in operation by July 1.

The Illinois Zinc Works, at La Salle, will soon erect a sheet zinc rolling mill, which will give employment to 100 more men.

Youngstown, O., is determined to have a Bessemer Steel Works. Brier Hill Iron & Coal Co. have subscribed $100,000 to the enterprise.

The Knife Works Co., at Akron, O., are putting up a building 200x40 ft., three stories high. They will put in a new engine, also new grindstones and machinery.

Smith, Vaile & Co., Dayton, O., are about to erect a new machine shop, blacksmith shop and foundry. They will have a capacity to employ 200 men when completed.

Youngstown, O., has commenced upon, or has in near prospect, new car works, steel works, glass works, toothed harrow works, cutlery works, malleable iron works and other industrial enterprises.

Downingtown, Pa., offers to exempt from borough taxes for ten years every manufacturing establishment in the town which employs ten or more workmen.

The officials of the Selma, Rome & Dalton Railroad, are looking around for a place to locate the railroad shops. Anniston, Ala., is being put forward as a suitable location.

The A. G. S. Railroad Company has recently commenced a complete reconstruction of its shops in Chattanooga, and is making valuable improvements and extensive additions.

H. W. Pease is erecting some brick buildings for a factory on Ainslie street, between 9th and 10th streets, Brooklyn, N. Y. The boiler room is 17x26 ft. and the engine room 17x36 feet.

The Brown & Sharpe Manufacturing Company, Providence, R. I., have 450 men at work, and want more good machinists to enable them to supply the increasing demand for their machinery and tools.

Nearly all the stock of the Keystone Agricultural Works, at Pottstown, Pa., had been subscribed for last week. It is proposed to begin operations at once.

A cotton or woolen factory is talked of at Bangor, Me., with a million dollars capital. The projectors are George Stetson, Chas. Stetson, Samuel H. Blake, and other wealthy men of that town.

The A. Plamondon Manufacturing Company, Chicago, will soon put up an extension to their shops 150x84 feet, four stories high. They build flour mill and special machinery.

Geo. W. Fifield, Lowell, Mass., has increased his shop room considerably, in order to meet the demand for his engine lathes. He employs about 50 men.

The Southard Manufacturing Company, Richmond, Me., will erect a bagging factory 100x48 ft., four stories high, with wings, storehouses, etc. It will contain 60 looms.

G. D. Barr, Buffalo, N. Y., is putting up a four-story factory on the Terrace, 100x75 ft. It will be used for the manufacture of leather belting and hose, and is to be completed May 1.

The Dueber Watch Case Manufacturing Company, Cincinnati, O., will erect a new factory 196x38 ft., three stories high, to cost $30,000. It is expected to be ready for operations in 90 days.

Reports of a twenty per cent. reduction of wages in portions of the armory at Ilion, N. Y., are exciting much comment among the employes. Tableaux —low wages and high rents.—*Syracuse Evening Herald*.

Boiler Makers' Union of Pittsburgh and Alleghany City, Pa., demand pay for time and a half for all repair work and double time for night work, triple time for Saturday night and quadruple time for Sunday.

Every locomotive works in the United States is pushed to its utmost capacity, with orders far ahead. Some four or five new locomotive companies have been organized to build new shops and catch a share of the unprecedented boom.

A. L. Wright and Benjamin Lawrence, who are now manufacturers of wood working machinery in Lowell, Mass., are about to begin the manufacture of engine lathes. They will increase their help and facilities for production.

Warner & Swasey started about a year ago to build machine tools in Chicago. They have now decided to move to Cleveland, O., where they are building a new shop. They have taken a single order for 140 machines for the Joel Hayden Brass Works just established at Lorain, O.

The Jackson & Sharpe Company of Wilmington, Del., have added five acres of ground to their works, on which they have built several new shops. Additions have been made to others, and a new Corliss engine and two new boilers put in. They have put 200 extra employes at work.

The spring opens with unusual activity in building new shops, mills and factories and additions to old ones, in all parts of the country, as will be observed by a perusal of the items under the heading of "Manufactures" this week. This seems to be an auspicious time to start new manufacturing enterprises.

Jacob Dailey, Bridgeton, N. J., offers two to five acres of land to any party who will establish a manufactory on his property, employing 25 to 100 persons or more. A stream of water of considerable size runs through the land. The site is a good one and the city of Bridgeton exempts from tax for ten years manufactories located within its limits.

The Yale Lock Co., Stamford, Conn., are about to put up a 277x50 ft. building, three stories high, for the manufacture of traveling cranes and locks. They will also build a new 120 x 100 ft. iron and brass foundry. Power will be furnished by a new 200 H.P. engine. When the new buildings are complete their present force of 275 hands will be doubled.

F. F. Hemenway's Automatic Cut-off Engine, illustrated in the AMERICAN MACHINIST of March 19th, is in use by the following parties in Troy, N.Y.; Rensselaer Iron Works, Albany Iron Works, W. & L. E. Gurley, Sanford & Robinson, Chas. Cleminshaw and the Tibbits Building. Several others have recently been sold, and are in use in different parts of the country.

The Walworth Manufacturing Co., of Boston, inform us that they have been awarded the contract for the Steam Warming and Ventilating Apparatus, for the new State Capital Building at Des Moines, Iowa, amounting to about $70,000, and that this is the third State Capital Building, as well as several hospitals and other large public buildings at the West, for which this Company have received contracts.

J. A. Fay & Co., Cincinnati, Ohio, the damage to whose shops by fire was recently noted in our columns have issued the following circular under date March 22nd, 1881.

We are happy to announce that the fire which occurred to our works, on the morning of the 6th inst., was less disastrous than at first supposed, as our large Corliss engine and boiler, our new four story brick shop, over one hundred and fifty feet long, and a portion of our buildings fronting on John Street were saved. In order to meet this emergency we have secured additional factory facilities, fully equipped with tools, which in addition to those saved, will give us a capacity to work four hundred men. These will be in operation within the present week. Should it be found necessary, in order to keep up with our orders, to run a (double) set of night and day workmen we shall do so.

We have commenced the erection of still more extensive buildings, which will be completed and in operation within the next ninety days, greatly increasing our hitherto large manufacturing facilities, and enabling us to meet the increasing demand for our Labor-saving Wood-Working Machinery with our usual promptness and dispatch. We take this occasion to express our heartfelt thanks to our friends and patrons throughout the country, for the many kind words of cheer and sympathy they have so bountifully extended to us by telegraph, mail, and otherwise, and assure them they are fully appreciated, and we trust in the future, as in the past, we shall continue to merit their approbation and favor.

Machinists' and Engineers' Supplies.

New York, March 31, 1881.

Trade is buoyant and both dealers and manufacturers wear smiling countenances.

Frasse & Co., 62 Chatham St., N. Y., are introducing a new polishing lathe in which the countershaft is placed under instead of behind the table to economize space; also an improved polishing head having changeable centers to be used either for drills or buff wheels, which may be removed when not in use.

A new, cheap, yet finely finished surface gauge is now ready for the market and is made in two sizes nickel plated. The first invoice of these goods is expected in a few days, and will be noted here.

The manufacturers of Milled Machine Screws at a meeting, held in New York recently, formed an organization to be known as the Association of Machine Screw Manufacturers of U. S. A. Geo. A. Fairfield, of the Hartford Machine Screw Co., is the Pres't and C. E. Roberts of The Chicago Screw Co., Sec'y. The object of this meeting was to simplify and equalize their price lists—making them uniform. The revised list will be issued June 1.

We have received from Ribon & March, Jersey City, N. J., a new finely printed and illustrated catalogue of machinery manufactured and sold by them. It is a "red line edition" of 140 large pages, and embraces engines, boilers, machine tools, mining machinery, etc.

L. B. Eaton & Rexford, 11 N. 6th St., Philadelphia, are introducing a special line of small emery wheels, also a brand of hand-cut files under their own name.

Miller, Metcalf & Parkin, Crescent Steel Works, Pittsburgh, Pa., have issued a small circular upon which is printed by the heliotype process graphic representations of steel broken from the same bar showing effect of hardening. They guarantee their drill rods to show unsurpassable results if hardened at the proper heat, "by which we mean just that heat which will produce the peculiar condition known as 'refined by hardening.' In no other condition is hardened steel at its best."

Iron and Metal Review.

New York, March 31st.

Pig iron remains dull but firm. No. 1 Foundry $25 to $26, No. 2 $22 to $23 and grey forge $20 to $21 There is a small demand for Scotch pig at $22 for Eglinton, $24.50 to $25 for Coltness, and $23 to $23.50 for Glengarnock and Gartscherrie. Mill irons are steady on the basis of 2.5c. for refined bar from store. Steel rails, $63 to $65, and iron rails, $48 to $50 at mill. Old T rails are very quiet, at $27 to $28. Wrought scrap is quoted at $30 to $31 for No. 1, with no transaction of note.

Ingot copper 19¼c. to 19¼c. for Lake; Straits tin, 20c, to 20½c.; Billiton and Australian tin, 20⅛c.; common pig lead, 4⅜c. to 4¾c., and refined lead, 4¾c, to 4⅞c.; domestic spelter, 5c, to 5⅛c.; sheet zinc, 7c.; antimony, 14½c. to 14¾c.

WANTED

Wanted, a Mechanical Draughtsman who is thoroughly acquainted with Locomotive work, and is accustomed to working up elevations and details. Address A.B., American Machinist Office.

Wanted, at the Pittsburgh Locomotive Works, a General Machine Foreman; a good position can be offered to the right man. Address D. A. Wightman, Supt., giving experience and salary required.

Wanted, a few first-class Machinists. Brown & Sharpe Mfg. Co., Providence, R.I.

Good Draughtsman, Patternmaker and Machinist wants a permanency. J.F., 116 Canal st., Newark, NJ.

Wanted—A designer and draughtsman, who is also practical, at present a foreman, with good experience in one of the leading machine tool shops and in sewing machine and other shops in New England, will soon be at liberty to engage. Address "Designer," 55 Huyshope Avenue, Hartford, Conn.

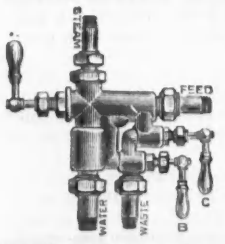
Good Boiler Makers wanted, steady employment. Address Porter Manufacturing Co., Limited, Syracuse, N. Y.

Wanted.—In a Machine Shop, a young active man, who has had experience in Mechanical Drawing, and is capable of designing, can find steady employment if suitable. Address, with reference and particulars, Draughtsman, Box 12, Office American Machinist.

Wanted, a Foreman Machinist, competent to take full charge of a shop of 50 men in all its details. A steady position if suitable. Address, with reference and salary expected, Box 5, American Machinist Office.

Wanted—Experienced machinists and vise men. Nordyke & Marmon Co., Indianapolis, Ind.

Wanted.—Experienced tool maker to work in tool room. Address, stating experience, wages wanted, &c., David W. Pond, Worcester, Mass.



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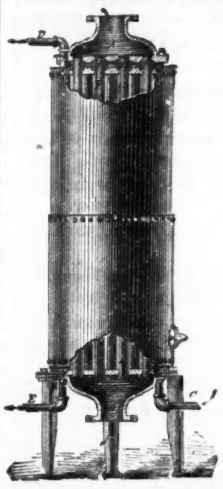

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ALGEBRA Self-Taught. By Paget Higgs, M. A., D. Sc. $1.00.

CASTING AND FOUNDING. Including descriptions of the Modern Machinery employed in the Art. By N. E. Spretson. 82 plates. $7.00.

STEEL: its History, Manufacture, Properties and Uses. By J. S. Jeans. Thick 8vo, cloth. $14.50.

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The best and cheapest in the end. Send for quotations. The files speak for themselves in the following testimonials. Read them.

THE SINGER MANUFACTURING CO.

Messrs. Kearney & Foot, Elizabethport, N. J., July 9th, 1877.

Dear Sirs:—We have for the past ten years used the Files of your manufacture, and during that time we have never had any fault to find with them. We can safely affirm that for evenness of temper, sharpness of cut, accuracy of shape and all other qualities which go to make up a perfect File, they are equal, and in some respects superior, to the best English-made Files. Very Truly, Wm. H. INSLEE, Contractor.

Messrs. Kearney & Foot, Elizabethport, N. J., May 3rd, 1877.

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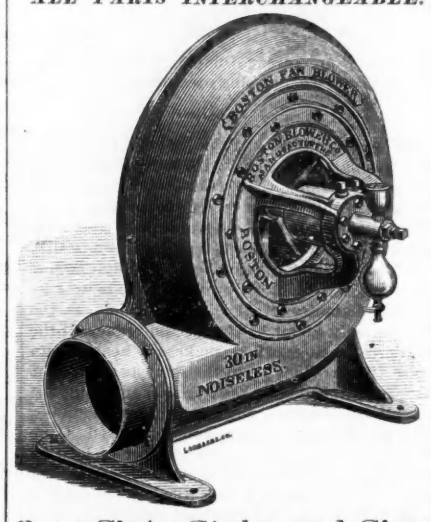

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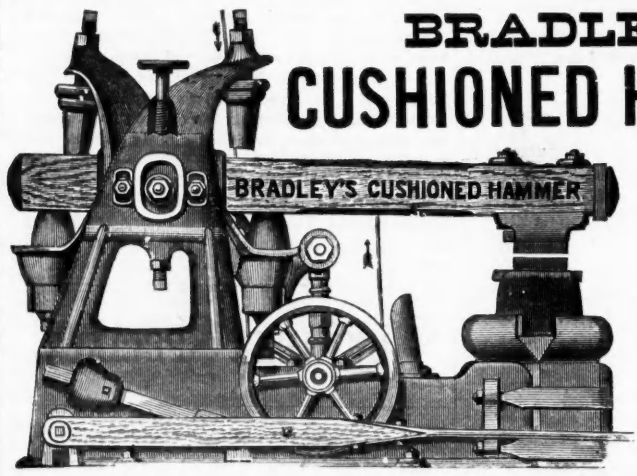

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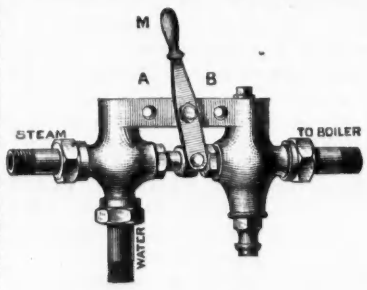

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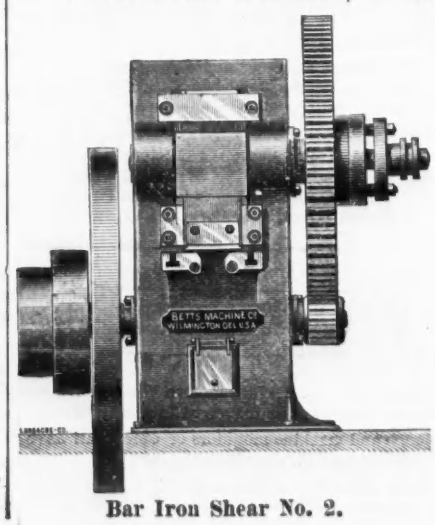

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